MWP

Chapter 06 Biodiversity

Ballycar Wind Farm

6. Biodiversity

6.1 Introduction

This chapter considers the potential effects on Biodiversity (excluding Ornithology) which may arise from the proposed development. A full description of the proposed development, and all associated project elements is provided in Chapter 2 Description of the Proposed Development of this EIAR.

This chapter does not include Ornithology, which is addressed in Chapter 7 Ornithology of this EIAR.

This chapter is supported by several appendices included in Volume III of the EIAR. The full suite of Appendices attached to this chapter are as follows:

- Appendix 6A Bat Survey Report;
- Appendix 6B Non-Volant Mammal Survey Report;
- Appendix 6C Aquatic Survey Report;
- Appendix 6D Marsh Fritillary Report;
- Appendix 6E Biodiversity Enhancement Management Plan;
- Appendix 6F Invasive Species Report.

A Screening for Appropriate Assessment report and Natura Impact Statement (NIS) report which considers the potential impacts of the proposed project on the integrity of the relevant Natura 2000 site(s), either alone or in combination with other plans or projects, with respect to the Conservation Objectives of the Natura 2000 sites in question, have been prepared as standalone documents which are submitted with the planning application. The Screening has considered 'standard features', i.e., all constituent elements of that project inherent in it/elements that are incorporated into a project's design not with the aim of reducing its negative effects including where these have the effect of reducing harmful effects on a European site. This means that 'measures/features' incorporated into a project design not aiming directly to reduce negative effects (i.e., are good practice/industrial standard/make sense practically but do have the effect of reducing impacts on European sites) can be used to determine the outcome of the screening.

6.1.1 Competency of Assessor

The assessment was completed by Otto Storan (MSc., BSc. (Hons)), Ecologist with MWP. Marie Kearns (MSc., BSc.) former Ecologist with MWP and Gerard Hayes (BSc), Senior Aquatic Ecologist with MWP, were contributing authors to the report.

Field surveys were undertaken by Gerard Hayes and Hazel Dalton (BSc., BBus.), Senior Ecologists with MWP, supported by Marie Kearns (BSc., MSc.) and Deirdre O'Brien (BSc.), Ecologist with MWP. Follow up surveying of the site was undertaken by Otto Storan, Hazel Dalton and Gerard Hayes.

Otto holds an MSc in Applied Environmental Science from University College Dublin (UCD) and an honours BSc in Applied Freshwater and Marine Biology from Atlantic Technological University (ATU, formerly GMIT). Otto's core professional work to date has focussed on the implementation of European legislation in the context of the Water Framework Directive, the Habitats Directive, Birds Directive and EIA Directive and has undertaken and prepared assessment reports for a range of coastal, marine, and terrestrial projects.

Marie Kearns has a background in both terrestrial and marine ecology with professional experience in the detection and identification of Irish fauna. In addition to her field experience, she has authored a variety of ecological reports including for Ecological Impact Assessment (EcIA) and AA.

Gerard Hayes is a Senior Aquatic Ecologist with over 15 years of experience working in environmental consultancy. He has extensive experience in environmental reporting and surveying techniques. Gerard has a diverse ecological profile, with Phase 1 habitat, tree, mammal (including bats), fish, bird, amphibian, macroinvertebrate survey experience. He is a co-author and carried out surveys for NPWS Irish Wildlife Manual Nos. 15, 24, 26, 37.

Hazel Dalton is a Senior Ecologist with almost eight years' experience with MWP in ecological surveying and impact assessment for AA and EIAR. She has authored and contributed to numerous screening reports for AA, Natura Impact Statements (NIS) and EcIA. Hazel is an experienced field ecologist with a diverse ecological survey profile including habitats and flora, mammals and birds.

Deirdre O'Brien is an Ecologist with demonstrable experience in ecological report-writing including EcIA and AA, as well as surveying for flora and fauna including invasive species, habitats, mammals, freshwater macro-invertebrates and biological water quality surveying.

Ken Bond is one of Ireland's leading authorities on Lepidoptera (butterflies and moths), having spent almost 40 years surveying and recording moths and butterflies for all counties in Ireland. Larval web surveys for Marsh Fritillary (*Euphydryas aurinia*) were undertaken with the assistance of Ken.

6.1.2 Legislation and Published Guidance

Important legislation underpinning biodiversity and nature conservation in Ireland comprise the:

- EU Habitats Directive (92/43/EEC), as amended;
- EU Birds Directive (2009/147/EC, as amended);
- EU Water Framework Directive (WFD, 2000/60/EC);
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015 (S.I. 477/2011) and the European Union (Birds and Natural Habitats) (Amendment) Regulations 2021 (S.I. 293/2021);
- Planning and Development Act (2000), as amended;
- Planning and Development Regulations 2001 to 2023, as amended;
- Wildlife Acts 1976 to 2021, as amended;
- Flora (Protection) Order, 2022.

This assessment was undertaken in accordance with the recent EPA best-practice guidance 'Guidelines on information to be contained in Environmental Impact Statements' (EPA, 2022).

The following other guidance documents and relevant publications were considered:

- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Best Practice Guidance for Habitat Survey and Mapping (Smith *et al.*, 2011);
- Guidance document on wind energy developments and EU nature legislation. Guidance document (European Commission, 2020);

- Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH[1], 2019, 2021);
- Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. (Marnell *et. al*, 2022);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). (BCT/Collins, 2016);
- Other information sources and reports footnoted in the course of the report.

6.1.3 Scope of Assessment

This assessment considers the potential effects with regard to each phase of the development: construction phase, operational phase and decommissioning phase. Appropriate mitigation measures are described to avoid, reduce or offset potential negative impact(s).

The specific objectives of the assessment were to:

- Identify and document protected habitats and species in the study area and extending away from it through a desk top study of available ecological data;
- Undertake baseline ecological surveys at the study area and evaluate the nature conservation importance of the ecological resources identified using a scientifically robust and objective methodology based on current National and International best practice;
- Predict any potential direct, indirect and cumulative effects of the project on Biodiversity;
- Prescribe measures to mitigate any potential negative effects of the project on Biodiversity;
- Identify habitats within the study area that can benefit from ecological management for the purpose of local Biodiversity enhancement.

6.1.4 Zone of Influence (ZOI)

The study area for the purposes of this assessment covers an area of 407ha, which is mainly covered in conifer plantation and farmland. A 15km survey radius was applied to the site for the desk based studies (as proposed in Scott Wilson *et al*., 2006). Following the initial desk study, ecological walkovers in and around the proposed development site and grid route were undertaken across various dates in 2021, 2022 and 2023 (dates outlined in relevant sections) to define the scope of the surveys, the scale of the field study area and to identify any ecological constraints to the project. The following were considered when identifying the potential ZOI at the initial stages of the project:

- The nature, size and location of the project;
- Sensitive habitats and species;
- Identification of suitable habitats for high conservation value species;
- Ecological connectivity between the project and the wider landscape;
- The sensitivities of the relevant key ecological receptors;
- Identification of potential effect pathways to key ecological receptors;
- Habitat connectivity and foraging ranges of fauna.

[1] NatureScot is the operating name for the body formally called Scottish Natural Heritage (SNH).

The main study area for the project included all lands within the overall landholding boundary, which encompasses the proposed windfarm site and proposed grid connection route, as well as the adjacent habitats and downstream watercourses ecologically connected to them, as shown in Figure 6-1 below.

The Zone of Influence (ZoI) represents a likely zone of influence wherein receptors are or are not likely to be significantly affected by the proposed development. The ZoI encompassed the study area, and the full extent of surface water catchments to their coastal outfalls, including the designated sites and features of interest which are hydrologically connected to the development site and gird route.

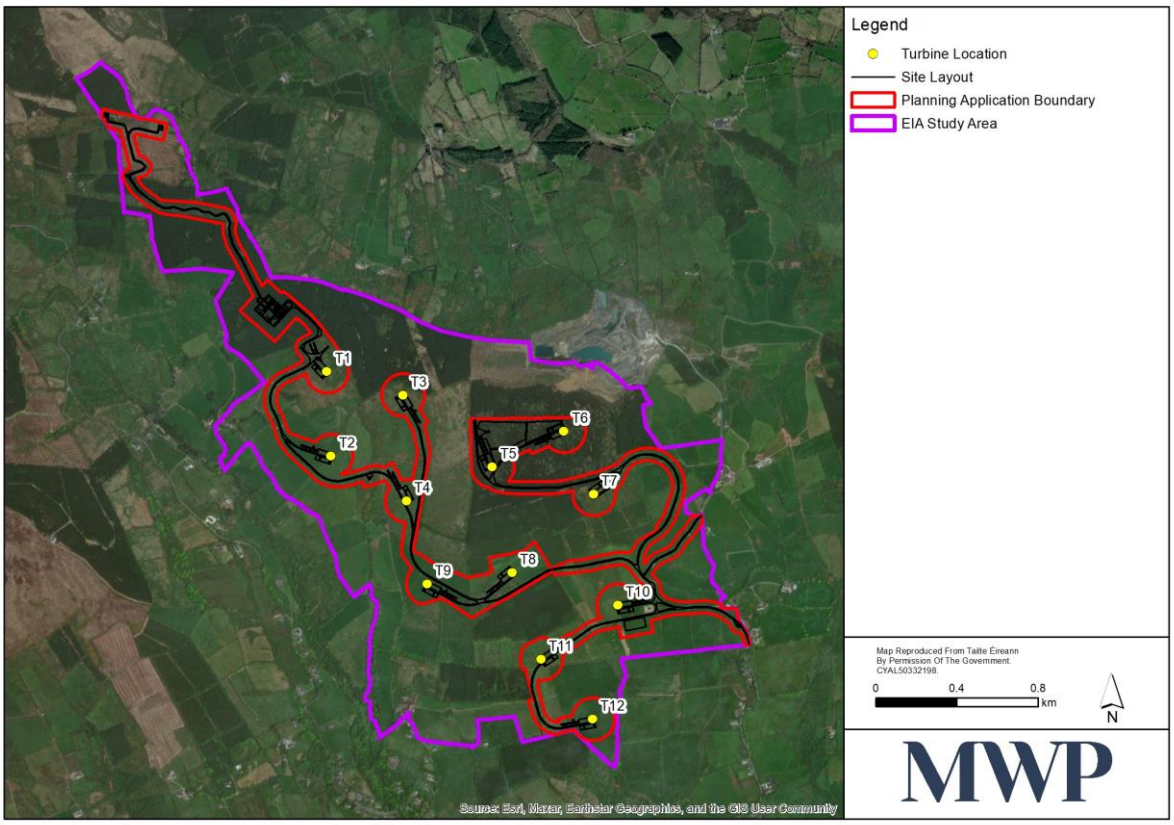

Figure 6-1: EIA study area including planning application boundary and proposed grid route

6.2 Methodology

6.2.1 Desktop Study

The desk study undertaken for this assessment included a review of available published data on sites designated for nature conservation, and other ecologically sensitive sites, habitats and species of interest in the vicinity of the proposed study area. The available ecological data which were accessed included the following:

- OSI Aerial photography and 1:50,000 mapping, and other mapping sources (online);
- National Parks and Wildlife Service (NPWS) online mapping and datasets;
- Heritage Maps online mapping;
- National Biodiversity Data Centre (NBDC) online mapping and datasets;

- Environmental Protection Agency (EPA) online mapping and datasets;
- Geological Survey of Ireland (GSI) online mapping;
- Clare County Development Plan 2017 – 2023 (As Varied);
- Clare County Development Plan 2017 – 2023: Clare Renewable Energy Strategy;
- Clare County Development Plan 2017 – 2023: Clare Wind Energy Strategy;
- Clare Biodiversity Action Plan 2017 – 2023;
- Clare County Development Plan 2023 – 2029;
- National Biodiversity Action Plan 2017-2021;
- Threat Response Plan: Otter 2009-2011 (DEHLG, 2009);
- Bat Conservation Ireland – http://www.batconservationireland.org;
- Invasive Species Ireland - http://www.invasivespeciesireland.com/;
- Review of records of plant species protected under the Flora (Protection) Order (2022);
- Ireland Red List No. 10: Vascular Plants. (Wyse Jackson *et. al.,* 2016);
- Inland Fisheries Ireland (IFI) fish sampling reports and fish data online;
- Checklists of Protected and Threatened Species in Ireland. *Irish Wildlife Manuals,* No. 116 (Nelson, *et al*., 2019);
- Review of requested records from NPWS Rare and Protected Species database and BCIreland bat records/roost database;
- All-Ireland Pollinator Plan 2021-2025;
- Other information sources and reports footnoted or referenced.

The study area, encompassing the footprint of the proposed windfarm site and the proposed grid connection route, lies within Ordnance Survey National Grid hectad (10km square) R56 and species records for this hectad were downloaded from the NBDC database (accessed October 2022). The results of the database search for records of protected fauna and flora recorded from hectad R56 are provided below in the relevant sections.

Ordnance Survey (OSI) mapping and digital aerial photography of the proposed development site were utilised in the assessment to determine the range of habitats with potential to support protected fauna within the study area including ecological connecting features in the landscape (e.g. hedgerows/tree-lines, woodland edge habitat and watercourses). Online aerial mapping and satellite imagery was used in conjunction with publicly available GIS files to generate mapping, which together, helped inform the desktop study.

With regard to bats, the desktop study included a preliminary assessment of the availability of landscape features of importance to bats within the proposed wind farm area and/or that connecting it to the geographical area extending away from it. The NBDC's Bat Habitat Suitability Index (BHSI), available on the NBDC on-line mapping tool[2], derived from an analysis of the habitat and landscape associations of Irish bats compiled in Lundy *et al*. (2011), was reviewed in this regard. The index evaluation ratings range from 0 to 100 with 0 being the least favourable, and 100 the most favourable, for bats. Index evaluations are available for each species and an overall rating is also available for all species in combination.

[2] Maps - Biodiversity Maps (biodiversityireland.ie)

For more information on the desk-top study on bats, please refer to the 'Bat Survey Report' for the Proposed development which can be found in **Appendix 6A.**

6.2.2 Data Requests

A data request was made to NPWS on the 17th November 2021 for records of rare and/or protected species within the 10 km grid square encompassing the study area (R56).

Data requests were submitted to Bat Conservation Ireland (BCIreland) at the request of O'Donnell Environmental on 5th May 2023 for the provision of all bat records available for within a 30km radius from a central point within the proposed wind farm site.

6.2.3 Consultation

The following statutory and non-statutory bodies relevant to this chapter were consulted in relation to the proposed project:

Consultee	Biodiversity issue raised	Relevant Section/Appendix
Inland Fisheries Ireland (IFI)	Potential discharges to aquatic environment. Impacts to aquatic biodiversity, i.e., fish, fish habitat. Impacts to riparian habitat, particularly on-site streams.	Assessment of Impacts and Effects NIS CEMP Aquatic Ecology and Fish Survey Report
National Parks and Wildlife Service (NPWS)	Tree felling and loss of biodiversity habitat, sensitive habitats and surface waters. Protected habitats and species, e.g., annex I and II habitats and species, annex I bird species. Designated sites (pNHAs, NHAS, etc.), Birds of Conservation Concern in Ireland (BoCCI), Red data book species Cumulative impacts.	Assessment of Impacts and Effects NIS CEMP Biodiversity Enhancement Management Plan
Clare County Council	Impacts to surface water and groundwater including impacts to quality, Planning in proximity to sensitive receptors, Impact of the proposal on habitats.	Assessment of Impacts and Effects
Department of Agriculture, Food and the Marine	Impacts of tree felling on designated sites and water	Assessment of Impacts and Effects

A full list of consultees and their responses is available in **Appendix 1B** of the **EIAR**.

6.2.4 Field Surveys

6.2.4.1 Habitats and Flora

Habitat surveys were undertaken in June, July, and August 2021 with follow-up surveys carried out in August 2022. The survey timing fell within the recognised optimum period for vegetation surveys/habitat mapping, *i.e*. April to September (Smith et al. 2011). Habitats were mapped according to the classification scheme outlined in the Heritage Council publication 'A Guide to Habitats in Ireland' (Fossitt, 2000) and following the guidelines contained in 'Best Practice Guidance for Habitat Survey and Mapping' (Smith et al. 2011).

Habitat surveys and mapping were considered when identifying ecological constraints during the early design stages of the project. Higher value habitats, particularly those with potential links to Annex I, were subsequently excluded from the developable area of the project.

In conjunction with the habitat surveys, botanical surveys were completed within the study area and included a 'look-see' search methodology (NRA, 2009) within habitat features likely to support protected species. This aimed to confirm the presence of plant species considered to be rare in both a national and local context (Scannell and Synnott, 1987), but with particular emphasis on the following:

- The plant species listed in Annex II of the EU Habitats Directive;
- Flora Protection Order species (FPO) (2022);
- Flora species listed in The Irish Red Data Book (Wyse Jackson et al. 2016).

Plant nomenclature for vascular plants followed 'Webb's An Irish Flora' (John Parnell and Tom Curtis Eight Edition). Mosses and liverworts followed 'Mosses and Liverworts of Britain and Ireland: a field guide' (Atherton *et al.*, 2010).

During habitat and flora surveys of the study area, any invasive plant species were recorded, with a focus on those species listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011). Any infestations encountered were recorded with regard to species, location and extent of infestation, and a photographic record made.

For results of habitat, flora and invasive plant species surveys, please see Section 6.3.6 and 6.3.7. below.

6.2.4.2 Non-Volant Mammals

The scope of the non-volant mammal (land-based mammals that cannot fly) surveys were informed by the initial ecological surveys carried out on site in June 2021 and species previously recorded in the 10 km square R56 encompassing the study area. Non-volant mammal surveys, apart from dedicated badger and otter surveys, were completed in June and July 2021. This survey was repeated on 18th July 2023.

Badger surveys were carried out on the 27th and 28th of October 2021 which confirmed a number of setts within the site. The site was checked again in March 2022 and July 2023 during other ecology surveys. Details of the sets can be found in Appendix 6B Non-Volant Mammal Report. Otter surveying was undertaken in June and July 2021 as well as in February 2022.

The surveys targeted species protected under the Wildlife Acts 1976 to 2021, as amended, species listed in Annex II, Annex IV and Annex V of the Habitats Directive, and Irish Red Listed species (Marnell et al. 2019). Particular focus was given to protected species such as Badger (*Meles meles*), Irish hare (*Lepus timidus hibernicus*), Pine marten (*Martes martes*), and Otter (*Lutra lutra*) given the type of habitat features present within the study area and the species records listed by the NBDC for hectad R56.

These surveys involved a comprehensive search for all mammal activity in the form of prints, scat, resting places, feeding signs, mammal trails and direct observations. These surveys followed the guidance outlined in 'Animal

Tracks and Signs' (Bang and Dahlstrom, 2004). In addition, 4 no. wildlife trail cameras were deployed in July, August and October 2021, under licence (Licence No. 55/2020).

Badger

Evidence of activity by badgers including latrines, hair, foraging activity (snuffle holes), commuting movements (badger tracks), setts and bedding was searched for and recorded during dedicated badger surveys carried out in October 2021 and July 2023 and other multi-disciplinary ecological field surveys within the study area. Surveying for badgers followed methodology in '*Surveying for Badgers: Good Practice Guidelines*' (Scottish Badgers, 2018).

Otter

Otter surveys were carried out with a particular focus given to watercourses within the study area. Surveys of existing stream crossings, both animal-made and human-made, were completed as part of the mammal surveys conducted in June and July 2021. Watercourses were surveyed again in February 2022. Survey methodology had regard to '*Monitoring the Otter Lutra lutra'* (Chanin, 2003a) and '*Ecology of the European Otter'* by Chanin (2003b). Otter signs searched for included spraints, footprints, tracks, couches and holts.

Pine Marten

Pine marten surveys were completed as part of the overall non-volant mammal surveys in June and July 2021 and July 2023. Surveys for this species primarily focused on the outskirts of the conifer plantation and woodland areas present within the study area. Any evidence of pine marten activity in the form of scat and prints was recorded.

For results of non-volant mammal surveys, please see **Section 6.3.8** below.

For more information on non-volant mammal surveys please refer to the 'Non-volant Mammal Survey Report' for the Proposed development which can be found in **Appendix 6B**.

6.2.4.3 Bats

Bat activity at the proposed wind farm was investigated using a combination of active and passive bat detector surveys combined with potential roost feature assessments.

Passive Automated Bat Surveys (PABS)

The multi-season passive detector survey was undertaken from spring 2023 to autumn 2023 following NatureScot (2021) guidelines, with modification for an Irish context, and NIEA Guidance (2022).

Detectors were deployed at 12 monitoring stations within the proposed development site for three seasonal periods (spring, autumn, and summer) to record general bat activity in locations corresponding to the proposed turbine layout. An additional detector was deployed along the proposed grid connection route in Autumn 2023. The likelihood of design changes are acknowledged in NatureScot (2021).

Proxy locations were used for the proposed location Turbine 5 and Turbine 6 locations across all survey periods as their exact location are proposed to occur within forestry and therefore were inaccessible at the time of the surveys. The proxy locations provided are considered to be representative of the habitat within which the proposed turbines would be located. Alternative locations were also used for Turbine 8 and Turbine 12 monitoring locations solely during the summer monitoring season as intended locations could not be accessed safely at the time of surveying. The locations of detectors deployed are shown in **Figure 6-2** and **Figure 6-3**. Details of equipment and passive bat survey results can be found in **Appendix 6A Bat Survey Report**.

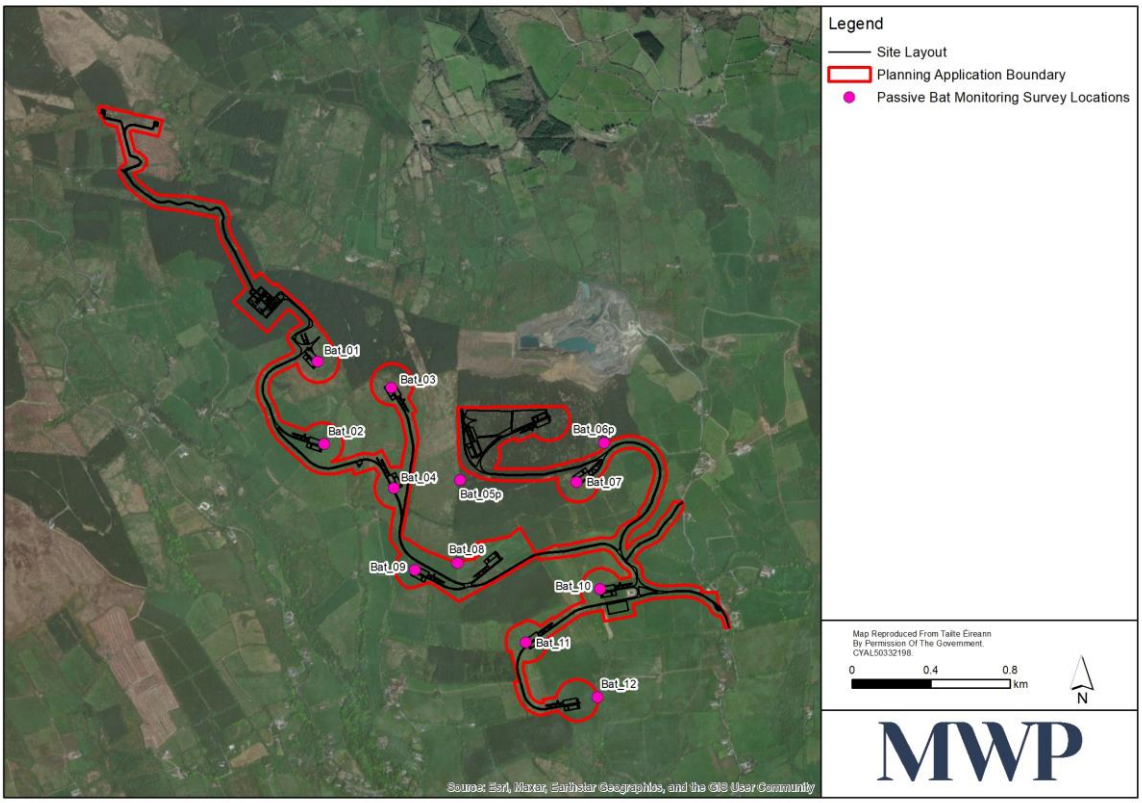

Figure 6-2: Distribution of passive bat monitoring locations in summer 2023

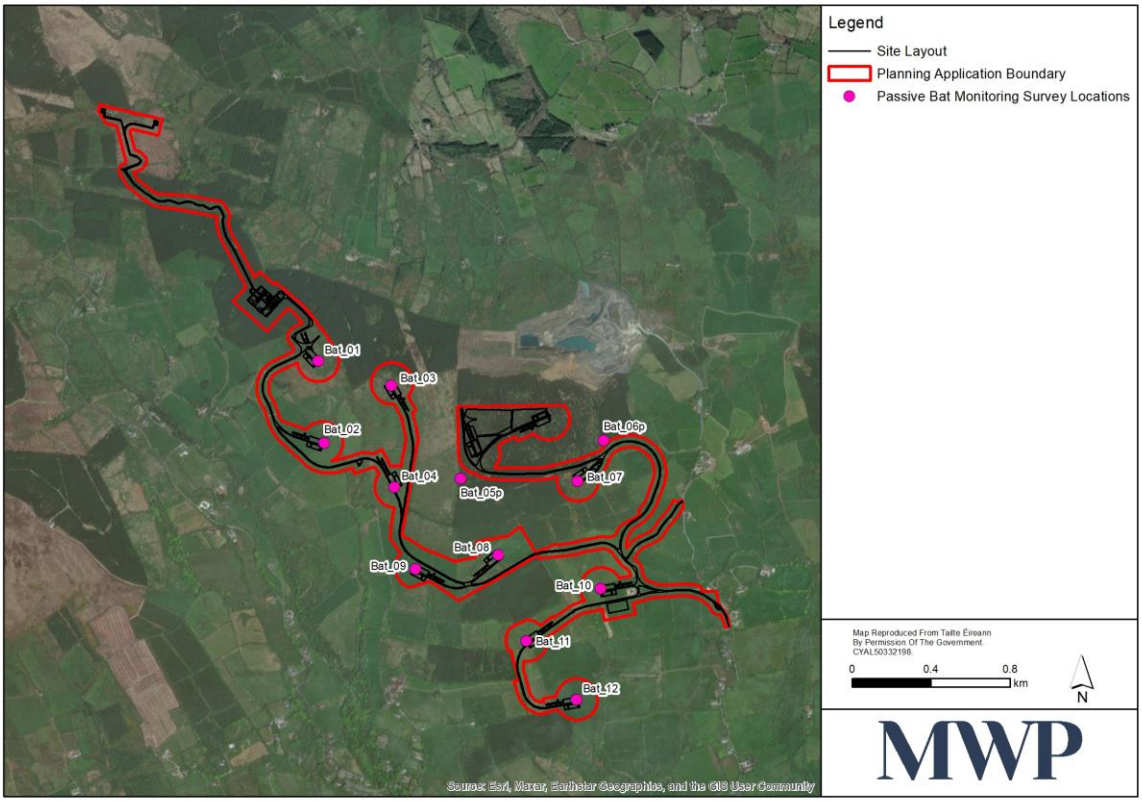

Figure 6-3: Distribution of passive bat monitoring locations in spring and autumn 2023

Active Transect Surveys

Active bat surveys were used to complement information obtained thought the passive bat monitoring. The aim of the active transect surveys was to identify flight lines which may be apparent, and to identify emergence behaviour which would indicate the presence of a roost. Three active surveys were carried out at the proposed site for approximately 1.5 hours from dusk on 6th June 2023, 21st August 2023 and 5th September 2023. Active surveys were carried out on public roads following Roche *et al*. (2008). The details of transect routes and locations of the proposed active survey routes are detailed in **Appendix 6A Bat Survey Report**.

Potential Roost Assessments (PRAs)

Targeted surveys were carried out to determine the Potential Roosting Features (PRFs) where proposed works may effect directly or indirectly on a PRF. Visual inspection of identified PRFs potentially affected by the proposed infrastructure, was carried out in October 2023.

NatureScot (2021) recommends that key roosting features which could support maternity roosts and significant hibernation and / or swarming sites on the wind farm site be identified in a search area extending to 200m plus one rotor radius from the "site boundary". NIEA (2022) guidance suggests that key features which may support roosting bats within 200m plus one rotor radius of the proposed turbine locations should be investigated. For this assessment the more comprehensive of the two search areas was chosen, following NatureScot (2021), and the potential for significant roosts outside the proposed works areas but within an area extending to a minimum of 268m from the 'redline' boundary (as it relates to turbines) was considered.

In an Irish context, significant roosts are typically associated with man-made structures and underground features such as caves and mines. Features with potential to accommodate a significant bat roost were identified through examination of OSi historic 6" black & white mapping, aerial imagery and site walkovers. Information on known mines and caves was identified through the examination of publicly available information produced by Geological Survey Ireland.

The potential suitability of structures and trees for roosting bats within and surrounding the proposed development site was classified according to the guidelines in Collins (2023)see **Table 2.1., Table 2.2** and **Table 2.3** in **Appendix 6A Bat Survey Report**.

6.2.4.4 Freshwater Aquatic Surveys

The aquatic field surveys comprised aquatic assessment at 11 representative sites on watercourses within and downstream of the study area (see **Figure 6-4** below). These sites were selected at/near roads and/or tracks. The following was completed at sites 1 – 10 and site 12 across the 2021 and 2023 surveys:

- Evaluation of aquatic habitats for fish and macroinvertebrates;
- Fish survey;
- Biotic assessment using aquatic macroinvertebrates;
- Water sampling for analysis of physico-chemical water parameters.

The above was also carried out at site 11 as part of the 2018 surveys carried out by MWP. Biological sampling and water quality indices, as well as macroinvertebrate functional feeding group analysis were used to evaluate watercourses as selected locations. Field work pertaining to aquatic habitats for fish and macroinvertebrates and physico-chemical analysis was carried out between the 18th and 24th of June 2021. Biological sampling and water quality sampling for physico-chemical analysis was repeated at site 1 – site 10 on 21st and 22nd June 2023.

Electro-fishing surveys were undertaken on 18th August 2021 and surveys for frog were undertaken on 23rd February 2022.

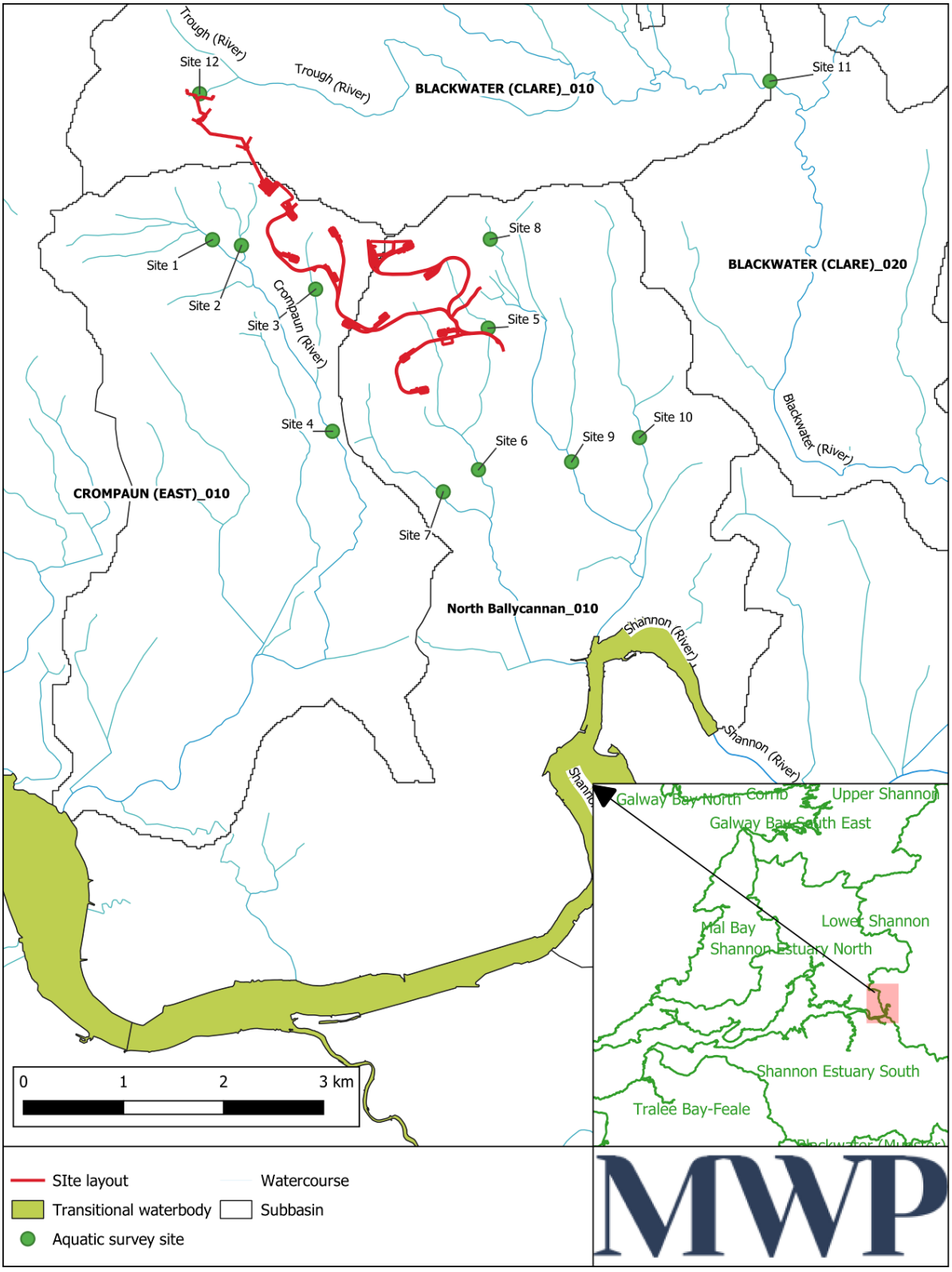

Figure 6-4: Watercourses and survey sites examined as part of the aquatic ecology studies for the proposed Ballycar Wind Farm

Aquatic Habitats

The study area was defined as fluvial habitats (watercourses) potentially affected by the proposed development, including within the proposed development site, and those downstream, within the receiving environment.

Habitat assessment was carried out at selected survey site locations using the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). Watercourses were photographed at survey site locations and at various locations throughout the study area. Anthropogenic and livestock influences on fluvial and riparian habitats were noted along the surveyed stretches. Aquatic survey sites were assessed in terms of:

- Stream width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance, i.e., large rocks, cobble, gravel, sand, mud etc.;
- Flow type, listing percentage of riffle[3], glide[4] and pool[5] in the sampling area;
- Instream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside and;
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

The publication 'Quantification of the freshwater salmon habitat asset in Ireland' by McGinnity *et al.* (2003) was also reviewed to assist in classifying the salmonid habitats encompassed within the study area. Watercourse names follow EPA nomenclature. Stream order is described using the classification system in Strahler (1957) which defines stream size based on a hierarchy of tributaries (with 1st order streams being the smallest).

Macroinvertebrates

Benthic Macroinvertebrates

Semi-quantitative sampling of benthic macroinvertebrates, or aquatic insects, was undertaken at sampling sites using kick-sampling (Toner et al., 2005). Benthic (bottom dwelling) macroinvertebrates are small stream-inhabiting creatures that are large enough to be seen with the naked eye and spend all or part of their life cycle in or on the stream bottom. Three replicate, 3-minute, multi-habitat kick samples were taken within a 50m stretch using a 1mm mesh kick net. All samples of invertebrates were combined for each site and live sorted on location, fixed in ethanol and labelled for subsequent laboratory identification to determine species relative abundance and numbers.

Freshwater Pearl Mussel

The study area is not within a catchment listed in the NPWS *Margaritifera* Sensitive Areas Map[6] but the selected reach listed in Table 6-1 below was surveyed on a precautionary basis. MWP applied for and were issued a licence from NPWS to carry out freshwater pearl mussel (FPM) *Margaritifera margaritifera* survey work in the study area. The surveys were carried out between 18th and 24th June 2021 (licence No. C47/2021).

The potential for FPM to occur along each watercourse draining the Proposed development site was assessed with reference Skinner *et al.*, 2003. The areas surveyed were then selected on the basis of suitability (watercourse

[3] Described in EA (2003) as shallow, fast-flowing, water with a distinctly disturbed surface over unconsolidated gravel-pebble, or cobble, substrate
[4] Laminar flow where water movement did not produce a disturbed surface
[5] Little/no observable flow
[6] https://www.npws.ie/maps-and-data/habitat-and-species-data

size, modifications), accessibility (incl. safety), proximity to site, and zone of influence. The Crompaun River was not selected for survey taking account of the physically degraded state on the lower reaches, the only part of the catchment with enough flow to support FPM. Populations of the species are generally found in fast flowing waters with high oxygen content with gravel substrate and free from silt or extensive algae (Moorkens, 2000).

Table 6-1: FPM survey location on a river reach in the study area of the proposed Ballycar wind farm, Co. Clare.

Hydrometric Area/River Basin	Subbasin	Waterbody / Code	Segment code	Stream order	Survey stretch (ITM)		Approx. length of channel surveyed (m)
					Upstream	Downstream	
25/Lower Shannon	North Ballycannan	North Ballycannan	25_3896	3	556937, 659784	557546, 659729	500

Surveying for FPM was carried out following the NPWS guidance '*Margaritifera margaritifera*' Stage 1 and Stage 2 survey guidelines, Irish Wildlife Manuals, No. 12' (Anon, 2004). The watercourse reach examined was subject to a presence/absence survey which involved wading in the river while viewing the substrate and looking for FPM with the aid of a bathyscope and with polarised sunglasses. Instream movements were from downstream to upstream. The survey also involved checking for the presence of dead shells, particularly in depositing areas. The river condition and habitat features at the survey stretch were noted and the habitat evaluated with reference to Environmental Quality Objectives (EQOs) as specified in Schedule 4 of the '*European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations*', S.I. 296 of 2009.

Results from the survey were then compared with EQOs set for macroalgae set out in S.I. 296 of 2009.

Biological Water Quality

Benthic macroinvertebrates, or aquatic insects, were used as an indicator of water quality at each sampling site. The Quality Rating (Q) System and other biotic indices such as the 'BMWP'[7], 'ASPT'[8] and the 'EPT Index'[9] were used to classify biological water quality at all aquatic survey sites.

Physico-Chemical Water Quality

Water samples were taken from all sites on 24th June 2021 and 26th June 2023. Water levels and conditions were noted at the time of the survey. The following physico-chemical parameters were assessed at a laboratory: Ammonium, Total Ammonia, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Nitrite, Orthophosphate, Suspended Solids, Total Phosphorus, Total Hardness, Total Dissolved Solids, and Total Organic Carbon (TOC).

Each site was assigned a chemical status on a scale of High-Good-Moderate-Poor-Bad based on water quality standards given in Surface Water Regulations (DoEHLG, 2009) and the Salmonid Water Regulations (1998)[10].

Fish

An electro-fishing surveys were carried out on 18th August 2021 at all sites (except sites 11 and 12) under authorisation from the Department of Communication, Energy and Natural Resources under Section 14 of the Fisheries (Consolidation) Act, 1959 to 2022. The purpose of this survey was to assess fish populations present at

[7] Biological Monitoring Working Party (BMWP)
[8] Average Score Per Taxa (ASPT)
[9] Ephemeroptera Plecoptera Trichoptera (EPT Index)
[10] http://www.irishstatutebook.ie/eli/1988/si/293/made/en/print

selected sites on watercourses draining the proposed development. Sites were surveyed following the methodology outlined in the CFB guidance 'Methods for the Water Framework Directive - Electric Fishing in Wadable Reaches' (CFB, 2008).

Following completion of the fishing, the dimensions and physical habitat characteristics of each site were recorded, including area and flow characteristics. The surveys were carried out under ideal environmental conditions, low water levels and a bright day. Any fish captured during biological sampling and electrical fishing were recorded and identified with reference to the Freshwater Biological Association's publication 'Key to British Freshwater Fish with notes on their ecology and distribution' (Maitland, 2004) and other referenced sources.

Common Frog

The proposed development site was surveyed for frog spawning locations on 23rd February 2022. The focus of this survey was on wetter parts of the site, namely drainage ditches and depressions holding water. The locations of any frog spawn were recorded. The number of clumps of frog spawn at each location was recorded.

For more detailed information on aquatic survey methods, please see the 'Aquatic Survey Report' for the proposed development which can be found in **Appendix 6C**.

For results of the freshwater aquatic surveys, please see **Section 6.3.10** below.

6.2.4.5 Marsh Fritillary

Field surveys for marsh fritillary were conducted in July, August, and September 2021 and comprised a habitat condition assessment survey and a larval web survey, based on the methodology outlined in the NBDC Habitat Condition Assessment for Marsh Fritillary[11] and the NBDC's Marsh Fritillary Larval Web Survey[12].

Habitat condition assessment surveys were carried out by staff ecologists from MWP within pre-selected survey areas within the study area, comprising habitats considered potentially suitable for marsh fritillary, on the 20th and 22nd of July and on the 19th of August 2021.

For the Habitat Condition Survey for marsh fritillary, data was collected at survey sites with regard to vegetation height, abundance of the species food-plant devil's-bit scabious (*Succisa pratensis*), the degree of structure within vegetation, presence of invading scrub and any evidence of stock grazing.

Details of other characteristics including slope aspect, exposure and information on the extent of management, if any, were also recorded.

Based on the results of the assessment each survey area was assigned as 'Good', 'Suitable (under-grazed)', 'Suitable (over-grazed)' or 'Unsuitable' habitat.

Based on the results of the habitat condition assessment surveys, larval web surveys were carried out in those survey areas determined to comprise suitable habitat. These surveys were carried out by MWP ecologists and a Lepidoptera specialist, Ken Bond, on the 3rd and the 6th of September 2021.

This survey comprised of a plotted zigzag walking transect, covering as much of the suitable habitat (identified during the habitat condition assessment surveys) as possible, recording the number of occupied webs encountered. Unoccupied webs were also recorded, in order to collect more data of the study area.

Six occupied larval webs were recorded within an area in the north of the study area identified during habitat surveys as 'Dry-humid acid grassland (GS3)' occurring in mosaic with 'Wet grassland (GS4)'. A number of unoccupied larval webs were also recorded in the same area.

[11]Available at: http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Marsh-Fritillary-Habitat-Condition-Form.pdf
[12] Available at: http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Marsh-Fritillary-Larval-Survey-Form.pdf

For more detailed information on marsh fritillary survey methods, please see the 'Marsh Fritillary Report' for the proposed development which can be found in Appendix 6D.

For results of the marsh fritillary surveys undertaken, please see Section 6.3.12 below.

6.2.4.6 Statement of Limitations and Difficulties Encountered

Limitations to methodologies, procedures, equipment and knowledge can arise during the course of an ecological assessment. Some limitations may be foreseen and can be accounted for while others may not be apparent until the actual assessment has taken place.

The following minor survey and data analysis limitations were encountered and have been fully accounted for in the impact assessment:

- The proposed development site contains areas of dense conifer forestry plantations. Due to the inaccessibility of conifer plantations, the internal forestry area could not be surveyed. However, fire breaks, forestry clearings and the outskirts of the plantations were accessible for surveys;
- A trail camera went missing from where it was deployed outside of a potential badger sett and has not been recovered. To avoid further risk to equipment, no additional trail cameras were set up in this location. This location has been identified as a badger sett using the precautionary principle and for reasons outlined in Appendix 6B. The necessary protection measures outlined in *Guidelines for the Treatment of Badgers Prior to the Construction of National Roads Schemes* (NRA, 2005; 2009) will be applied in this case;
- Limitations relating to bat surveying are addressed in Appendix 6A where it is outlined that alternative static monitor locations were used for the proposed Turbine 8 and Turbine 12 during the summer monitoring season only as the intended locations were not safely accessible at the time of detector deployment. Nonetheless it is considered that sufficient coverage of the relevant habitats within the area was obtained, and access restrictions were not a significant limitation. No weather data was available for the first two nights of the summer monitoring period due to technical issues and the final four nights, due to damage of the weather station. The weather conditions for these nights were alternatively checked and considered to be suitable conditions for the survey. During the autumn survey season the detector deployed at the proposed Turbine 7 monitoring location ceased to record the night of the 30th August 2023 due to a technical difficulty, but resumed recording the night of 31st August.

The information contained in this chapter includes robust data which has been used to assess the likely significant effects of the proposed development on biodiversity. No substantial limitations were identified in terms of scale, scope or context in the preparation of this assessment.

6.2.5 Ecological Value

The value of the ecological receptors was determined using the ecological evaluation guidance given in the National Roads Authority (NRA)[13] Ecological Assessment Guidelines published in 2009 (NRA, 2009), as well as guidance provided in *Guidelines for Assessment of Ecological Impact Assessment in the UK and Ireland* (CIEEM, 2022). This evaluation scheme seeks to provide value ratings for ecological receptors, with values ranging from Locally Important to Internationally Important in an Irish context.

The function of this evaluation scheme is primarily to assess the value of a site. In this case, the scheme has been adapted to assess the value of habitats and species. The value of habitats is assessed based on its condition, size,

[13] Now Transport Infrastructure Ireland (TII).

rarity, conservation and legal status. The value of species is assessed on its biodiversity value, legal status and conservation status. Biodiversity value is based on its national distribution, abundance or rarity, and associated trends.

Important Ecological Features (IEFs) are rare ecological features (*i.e*. sites designated for nature conservation, habitats and/or species), which are evaluated as Locally Important (higher value) or greater and are likely to be impacted significantly by the proposed development. The features that were evaluated as being of Local Importance (higher value) and greater in this study were selected as IEFs after which impact significance on each of these features was assessed.

6.2.6 Scope of Assessment

6.2.6.1 Assessment Criteria

Determination of the significance of an effect will be made in accordance with the terminology outlined in the EPA guidance document 'Guidelines on Information to be contained in Environmental Impact Assessment Reports' (EPA, 2022) (as set out in Table 6-2 below).

Table 6-2: Summary of criteria for assessing impacts based on EPA (2022)

Parameter	Term	Description
Quality of Effects	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative /adverse	A change which reduces the quality of the environment
Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequence
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant	An effect which, by its character, magnitude duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude duration or intensity alters most of a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Extent and Context of Effect	Extent	Describe size of area, number of sites, proportion of a population affected by an effect
	Context	Describe the extent, duration, frequency will conform or contrast with baseline conditions (is it the biggest, longest effect ever?)
	Likely Effects	The effects can be reasonably expected to occur because of the planned project if all mitigation measures are properly implemented
	Unlikely Effects	The effect that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Duration of Effect	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year

Parameter	Term	Description
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effects lasting over sixty years
	Reversible	Effects than can be undone e.g. through remediation or restoration
	Frequency	How often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Types of Effects	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create a larger, more significant effect.
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out.
	'Worst case'	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described.
	Irreversible	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

6.3 Baseline Environment

6.3.1 Site Location and Description

The proposed development site is located in rural southeast County Clare, over 3km north of Limerick City and suburbs (see Figure 6-5 below). Lands within the site are managed for agriculture under varying levels of farming practice intensity, with areas of conifer plantation throughout. Commercially owned forestry plantations make up a considerable portion of the north part of the site. Access to the western section of the site is via a local road connected to Meelick/Knockalisheen Road (Local Road) to the south, and access to the eastern section of the site is via a private farm track connected to the Ballycar South Road (Local Road) to the east.

Lands surrounding the site are predominantly in agricultural use, interspersed with conifer plantations and single residential dwellings. An operational quarry is located directly north of the site, comprising an existing working area of 16.9 ha with planning approval for an extension of 10 ha, and existing concrete batching plant. A proposed underground connection between T1 and the proposed 110kV substation will be located northwest of T1. The underground connection from T1 is routed along existing forestry tracks and through conifer forestry to the north west of the wind farm site and connects to the proposed 110kV substation. From the proposed 110kV substation, an underground cable is routed in a north west direction where it connects to the existing 110 kV overhead line. The proposed 110kV grid route is approximately 1.5km in length. 1.0km of the 110kV grid route is proposed within existing forestry tracks. The remaining 0.5km is routed through conifer forestry. It also crosses a 3m wide local public road. A new unbound stone access track will be constructed over the 110kV grid route on private lands to allow access for future maintenance.

The proposed 110kV substation will comprise an outdoor electrical yard and two single storey buildings (one for the system operator and one for the wind farm operator). The system operator building will contain a control room, a storeroom, an office / canteen and a toilet. The wind farm operator building (or IPP substation building) will contain a storeroom, a communications room, a control room, a staff room, an office, a switchgear room and a toilet. Both substation buildings will be approximately 6.1m in height, with pitched roofs and an external blockwork and plastered finish. There will be a very small water requirement for toilet flushing and hand washing and therefore it is proposed to harvest water from the roofs of the buildings. The discharge from the toilet within each building will go to a holding tank located within the substation compound where the effluent will be temporarily stored and removed at regular intervals by an approved contractor. Parking for each building will be located within the compound area. The substation buildings and associated compound will be contained within a 2.6m high galvanised steel palisade fence. It is proposed to topsoil and revegetate the cut and fill slopes required for the substation site. There are areas of ecological importance present in the wider landscape, including Woodcock Hill NHA, located *c*. 1.1km to the west of the site, and the Lower River Shannon SAC, located *c.* 1km to the south of the site.

The delivery of turbine components to the proposed development will require temporary works on sections of the public road network along the delivery route including hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and temporary local road widening. Such works are temporary for the delivery of turbine components and are not included in the planning application boundary.

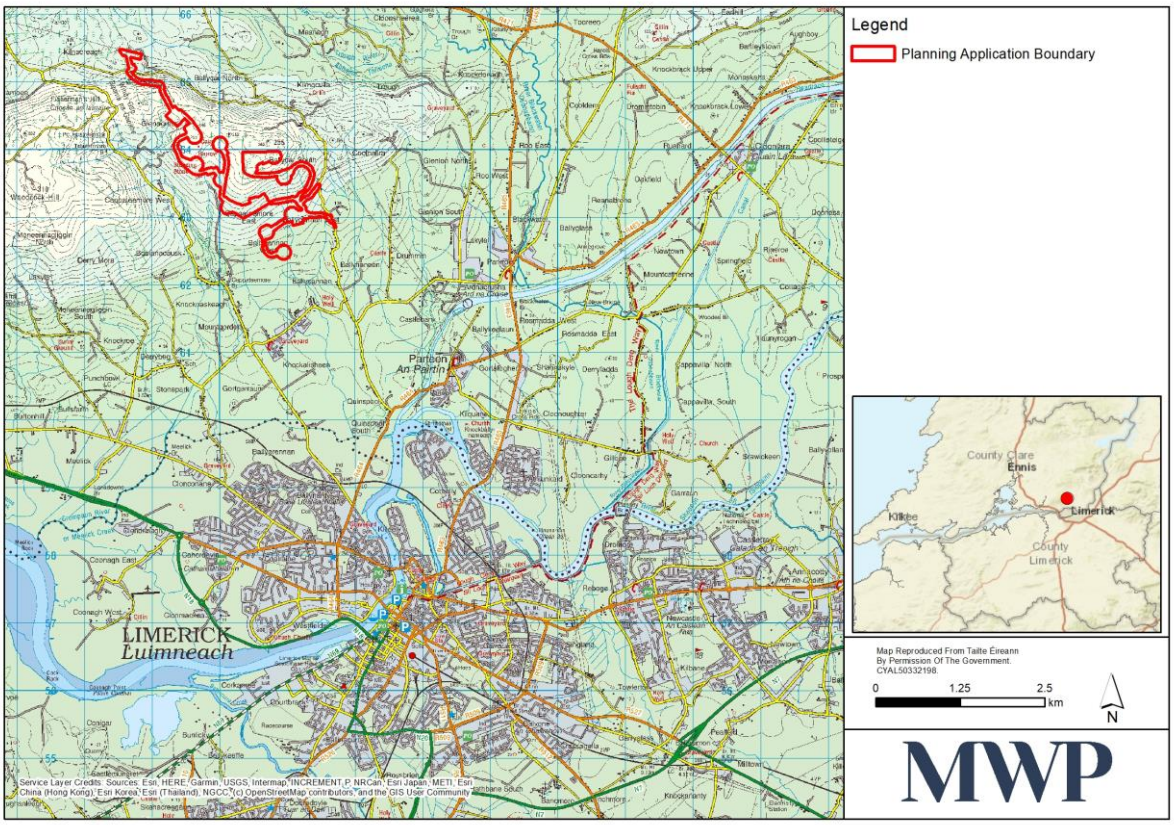

Figure 6-5: Location of the proposed Ballycar planning application boundary, Co. Clare

6.3.2 Proposed development

Refer to **Chapter 2 Description of the Proposed Development** for a detailed description of the proposed development.

In addition to the proposed development as described, the underground connection to the 110kV substation and subsequent connection to a 110kV overhead line is also assessed as part of the project.

6.3.3 Local Hydrology

The proposed wind farm site is located within the Shannon River Basin District and is encompassed within two catchment areas, Shannon Estuary North catchment (Owenogarney_SC_020 sub-catchment) to the west and Lower Shannon catchment (Shannon [Lower]_SC_100 sub-catchment) to the east. An account of the local hydrology and waterbodies is described below and detailed further in **Appendix 6C Aquatic Survey Report**. Rivers within the footprint of the site are detailed in **Figure 6-6** below.

The western component of the proposed development is within the Crompaun (East)_010 subbasin and is drained by two watercourses, including an unnamed minor watercourse that drains the western extent of the proposed development (stream segment code 27_430). The main mapped watercourse is the 1st order Cappateemore East Stream which rises within the study area and flows south into the 3rd order Crompaun [East] Stream. It is noted that the Cappateemore East Stream, as mapped by the EPA is actually much smaller in size than an adjacent stream that appears to have its source near the source of the Cappateemore East Stream. This stream that is not mapped by the EPA is classified as an 'eroding/upland river' using Fossitt (2000) criteria and is of far greater ecological importance than the EPA mapped channel.

The lower 5km reach of the Crompaun Stream has a low gradient and has been highly modified by drainage. Embankments have been constructed along the lower reaches of the watercourse to prevent backflow during high tides. This watercourse discharges to the Shannon Esturay approximately 3km west of Limerick City.

The eastern component of the proposed development is within the North Ballycannan_010 subbasin. The main watercourses in this area are, from east to west, the 3rd order South Ballycar Stream and the North Ballycannan Stream, a 1st order watercourse that rises within the study area boundary flowing south and discharging to the River Shannon c. 3.8km south of the study area. The southern reach of the North Ballycannan Stream forms part of the Lower River Shannon SAC, c.1km south of the study area. This watercourse is fed by two other watercourses located within the study area; the East Ballycannan Stream and the West Ballycannan Stream. Both of these streams are 1st order watercourses that rise within the study area boundary.

The proposed grid connection route and substation location to the north of the proposed wind farm site occur within the Blackwater (Clare) River catchment. The nearest watercourse to the proposed substation is a 1st order unnamed tributary (EPA segment code 27_430) of the Glenagross Stream in the Crompaun River catchment. The grid connection route crosses the 1st order Kilnacreagh Stream (EPA segment code 25_3206) which flows from west to east approximately 50m to the south of the nearest proposed tower to be erected to connect to the existing overhead line. The Kilnacreagh Stream joins the 1st order Trough River (EPA code 25B06, also known as the Blackwater River) which flows in a westerly direction for ca. 5.2 km until it is fed by the 3rd order Derryvinnann River. The crossing is within a conifer forestry area.

An access track will be provided over the cable and the crossing point of the cable will coincide with the crossing point of the proposed access track. A new bottomless culvert will be installed to carry both the track and the cable over the crossing. No instream works will be required. Details of the crossing methodologies for the track and cables within the wind farm are provided in **Chapter 3 Civil Engineering**. The same methodology will be applied for this cable crossing. Overall, in-stream works are not required along the proposed grid connection route.

As part of the monitoring requirements for compliance with the Water Frameworks Directive (Directive 2000/60/EC), the EPA carries out biological monitoring at stations within the Crompaun (East)_010 and North Ballycannan_010 subbasin, downstream of the proposed development site. The current WFD River Waterbody Status (2016 – 2021) of the streams draining the site within the Crompaun (East)_010 subbasin are 'Poor' and

have been assigned a WFD Risk category of 'At risk'. The WFD River Waterbody Status (2016 – 2021) of the watercourses draining the site within the North Ballycannan_010 subbasin are currently 'unassigned' and have been assigned a risk category of 'At risk'[14].

A review of the 'Owenogarney_SC_020 Sub-catchment Assessment WFD Cycle 2' report[15] determined that the following pressures have been identified with regard to this waterbody; channelisation, forestry, embankments, waste water discharge and agriculture. The Transitional Waterbody WFD latest status (2013 – 2018) of the 'Upper Shannon Estuary' into which the 'Crompaun (East)' River drains is 'poor'. A review of the 'Shannon [Lower]_SC_100 Sub-catchment Assessment WFD Cycle 2' report[16] determined that agriculture has been identified as a pressure on this waterbody. The Transitional Waterbody WFD latest status (2013 – 2018) of the 'Limerick Dock' waterbody into which the 'North Ballycannan' Stream drains is 'good'.

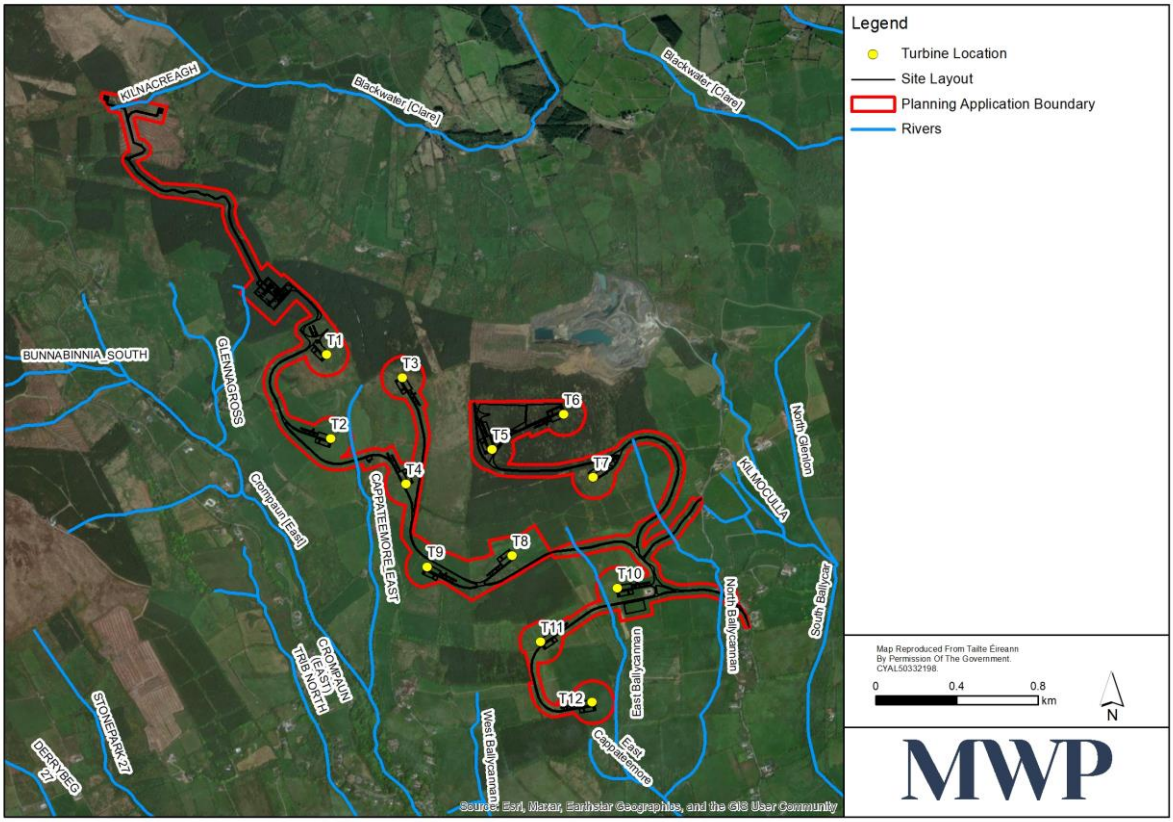

Figure 6-6: Rivers within vicinity of Planning Application Boundary

6.3.4 Designated Sites

All designated sites within 15km of the proposed development are considered to have the potential to be significantly impacted by the proposed development. Additionally, in line with the precautionary principle, designated sites that lie outside 15km that have the potential to be significantly impacted by the proposed development are also considered.

[14] Available at EPA Maps (Accessed 16/12/2021)
[15] Available at Subcatchment Assessment (catchments.ie) (Accessed 16/12/2021)
[16] Available at Subcatchment Assessment (catchments.ie) (Accessed 16/12/2021)

Following this, the potential effects associated with the proposed development will be identified before an assessment is made of the likely significance of these effects.

6.3.4.1 Sites of International Importance

Natura 2000 sites are sites of international importance for nature conservation and are designated and protected under European legislation. Two types of sites are incorporated within the Natura 2000 network; Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Special Areas of Conservation (SACs) are protected under the Habitats Directive 92/43/EEC and Special Protection Areas (SPAs) are protected under the Birds Directive 2009/147/EC. In Ireland, these European Directives are transposed into Irish legislation under the European Communities (Birds and Natural Habitats) Regulations 2011 to 2023, as amended. Collectively, SACs and SPAs are referred to as Natura 2000 or European sites.

A list of Natura 2000 Sites that can be potentially affected by the proposed project has been compiled. SACs and SPA sites within a 15km radius of the proposed development have been identified and listed in Table 6-3 and relevant Natura 2000 sites are shown in Figure 6-7. In line with the precautionary principle, Natura 2000 sites that lie outside 15km that may be significantly impacted as a result of the proposed works were also considered, particularly those that were within or overlapped with the WFD catchments within which the proposed development is located.

The study area of the proposed development does not lie within the boundary of any designated Natura 2000 site. Hence, the site of the proposed development does not form part of any Special Protection Area (SPA) or Special Area of Conservation (SAC). The designated sites within 15km of the Proposed development are considered to be within the potential Zone of Influence (ZOI) of the Proposed development (see Figure 6-7 and Table 6-3 below).

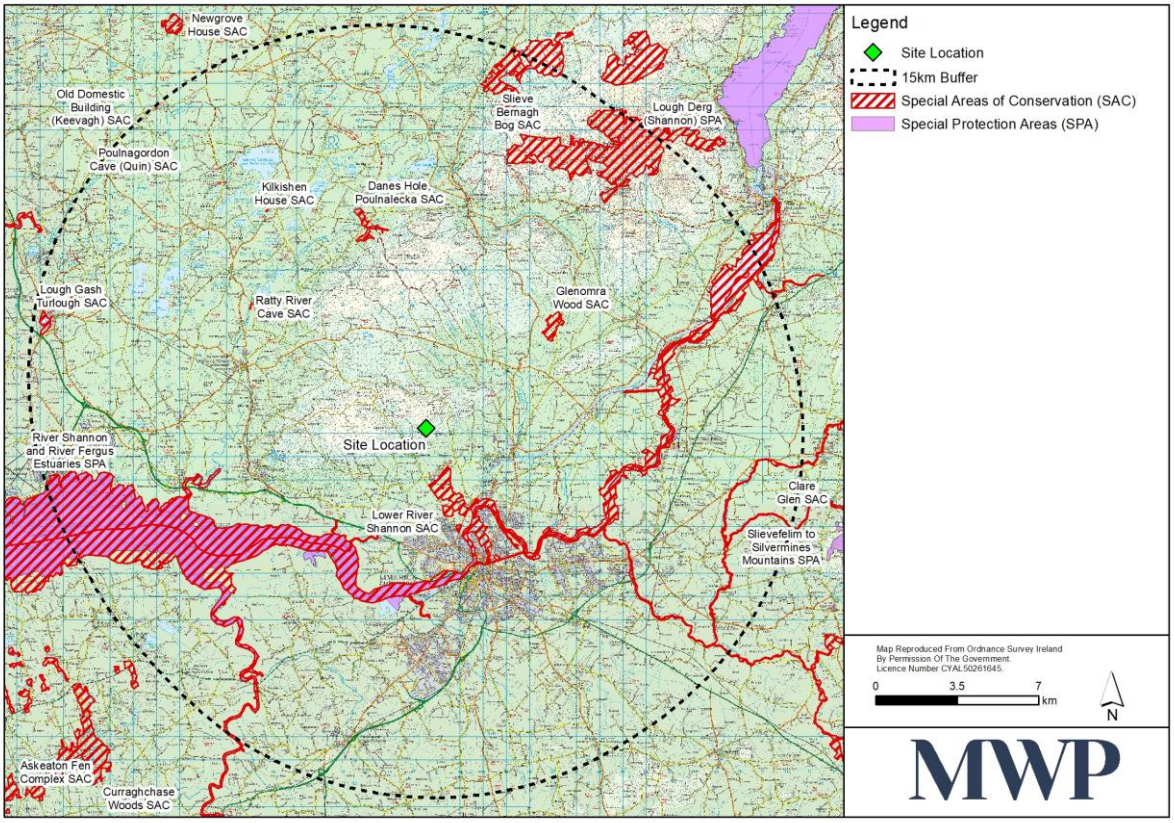

Figure 6-7: Natura 2000 sites within a 15km potential ZOI

Table 6-3: Natura 2000 sites within 15km of the Proposed development site

Designated Site	Site Code	Qualifying Features of Conservation Interest	Proximity and connection to study area
River Shannon and River Fergus Estuaries SPA	004077	• Cormorant *Phalacrocorax carbo* [A017] • Whooper Swan *Cygnus cygnus* [A038] • Light-bellied Brent Goose *Branta bernicla hrota* [A046] • Shelduck *Tadorna tadorna* [A048] • Wigeon *Anas penelope* [A050] • Teal *Anas crecca* [A052] • Pintail *Anas acuta* [A054] • Shoveler *Anas clypeata* [A056] • Scaup *Aythya marila* [A062] • Ringed Plover *Charadrius hiaticula* [A137] • Golden Plover *Pluvialis apricaria* [A140] • Grey Plover *Pluvialis squatarola* [A141] • Lapwing *Vanellus vanellus* [A142] • Knot *Calidris canutus* [A143] • Dunlin *Calidris alpina* [A149] • Black-tailed Godwit *Limosa limosa* [A156]	The SPA is located 4.4km to the southwest of the study area (approx. 3.1km from temporary works at junction of R464 and L3056). There is a hydrological connection linking the study area to this SPA via the watercourses that drain the study area which ultimately flow into the Shannon Estuary which is associated with the SPA.

Designated Site	Site Code	Qualifying Features of Conservation Interest	Proximity and connection to study area
		• Bar-tailed Godwit *Limosa lapponica* [A157] • Curlew *Numenius arquata* [A160] • Redshank *Tringa totanus* [A162] • Greenshank *Tringa nebularia* [A164] • Black-headed Gull *Chroicocephalus ridibundus* [A179] • Wetlands [A999]	
Lower River Shannon SAC	002165	• Sandbanks which are slightly covered by sea water all the time [1110] • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Coastal lagoons [1150] • Large shallow inlets and bays [1160] • Reefs [1170] • Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • *Salicornia* and other annuals colonising mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • Freshwater Pearl Mussel *Margaritifera margaritifera* [1029] • Sea lamprey *Petromyzon marinus* [1095] • Brook Lamprey *Lampetra planeri* [1096] • River Lamprey *Lampetra fluviatilis* [1099] • Salmon *Salmo salar* [1106] • Common Bottlenose Dolphin *Tursiops truncatus* [1349] • Otter *Lutra lutra* [1355]	The SAC is located 1km to the south of the study area (approx. 46m from temporary works at junction of R464 and L3056). There is a hydrological connection linking the study area to this SAC via the watercourses that drain the study area as these watercourses ultimately flow into the Shannon Estuary which is associated with the SAC.
Glenomra Wood SAC	001013	• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	The SAC is located 5.5km to the northeast of the study area. There is no ecological link between the study area and the SAC.
Danes Hole, Poulnalecka SAC	000030	• Caves not open to the public [8310]	The SAC is located 7.0km to the north of the study area.

Designated Site	Site Code	Qualifying Features of Conservation Interest	Proximity and connection to study area
		• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] • Lesser Horseshoe Bat *Rhinolophus hipposideros* [1303].	There is no ecological link between the study area and the SAC. The study area is located outside the maximum foraging range for lesser horseshoe bat (BCI, 2012).
Ratty River Cave SAC	002316	• Caves not open to the public [8310] • Lesser Horseshoe Bat *Rhinolophus hipposideros* [1303]	The SAC is located 7.6km to the northwest of the study area. There is no ecological link between the study area and the SAC. The study area is located outside the maximum foraging range for lesser horseshoe bat (BCI, 2012).
Kilkishen House SAC	002319	• Lesser Horseshoe Bat *Rhinolophus hipposideros* [1303]	The SAC is located 10.0km to the northwest of the study area. There is no ecological link between the study area and the SAC. The study area is located outside the maximum foraging range for lesser horseshoe bat (BCI, 2012).
Slieve Bernagh Bog SAC	002312	• Northern Atlantic wet heaths with *Erica tetralix* [4010] • European dry heaths [4030] • Blanket bogs (* if active bog) [7130]	The SAC is located 11.1km to the northeast of the study area. There is no hydrological link between the study area and the SAC.

River Shannon and River Fergus Estuaries SPA (004077)

The River Shannon and River Fergus Estuaries SPA encompasses the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. This site overlaps with the Lower River Shannon SAC.

The site has vast expanses of intertidal flats which contain a diverse macro-invertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches. The SPA is designated for 21 no. species of waterbirds listed in Table 6-3, that utilise the habitats within the SPA for foraging and roosting purposes. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are also of special conservation interest for 'Wetland & Waterbirds' (NPWS, 2015).

Lower River Shannon SAC (002165)

The Lower River Shannon SAC encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the

Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia. This site overlaps with the River Shannon and River Fergus SPA.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitats 'Coastal lagoons [1150]' and 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]', the only known resident population of bottle-nosed dolphin in Ireland and all three Irish lamprey species. The SAC is designated for 14 no. habitats that are estuarine, freshwater, marine and terrestrial in nature, and is designated for 7 no. aquatic species (NPWS, 2013). These qualifying features are listed in Table 6-3.

Glenomra Wood SAC (001013)

Glenomra Wood SAC is a deciduous woodland located in south-east Co. Clare, *c.* 10km north of Limerick city. Glenomra Wood is a good example of a deciduous semi-natural woodland and is of considerable conservation significance given that the SAC is designated for the Annex I habitat, '[91A0] Old Oak Woodlands' (NPWS, 2013).

Danes Hole, Poulnalecka SAC (000030)

Danes Hole, Poulnalecka SAC comprises a small fossil cave in the banks of the Ahaclare River situated within a wood *c*. 4km west of Broadford, Co. Clare. It is a winter hibernation site and also a mating site of the lesser horseshoe bat. A nearby summer roost for the bat and the commuting routes between the two are also included (NPWS, 2013).

Ratty River Cave SAC (002316)

Ratty River Cave SAC comprises a cave habitat that acts as an important winter roost and breeding site for the lesser horseshoe bat. The SAC is located *c.* 2.5km north of Sixmilebridge, Co. Clare (NPWS, 2014).

Kilkishen House SAC (002319)

Kilkishen House SAC comprises an 18th century, two-storey over basement mansion situated *c*. 7 km north of Sixmilebridge in Co. Clare. It contains an important winter roost of the lesser horseshoe bat. The building also contains a colony of Natterers' bats and acts as a summer roost for a smaller number of lesser horseshoe bats (NPWS, 2014).

Slieve Bernagh Bog SAC (002312)

Slieve Bernagh Bog SAC is situated to the west of Lough Derg, southeast Co. Clare. The SAC comprises the Slieve Bernagh mountain range, with the highest peaks at Moylussa (532 m) and Cragnamurragh (526 m), and the surrounding peatlands that flank its northern slopes. The site is designated for 'Northern Atlantic wet heaths with *Erica tetralix* [4010]', 'European dry heaths [4030]' and 'Blanket bogs (* if active bog) [7130]'.

The SAC is a site of considerable conservation importance as it contains a range of peatland types, including active blanket bog, a habitat listed with priority status under the E.U. Habitats Directive (NPWS, 2014).

Appropriate Assessment

A screening for Appropriate Assessment and Natura Impact Statement (NIS) have been prepared in relation to the proposed development. Please see Section 6.3.13 below and the standalone AA Screening report and NIS for more information.

The AA Screening report and NIS were undertaken in accordance with the European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001) and the

European Commission Guidance 'Managing Natura 2000 sites' (EC, 2018) and guidance prepared by the NPWS (DoEHLG, 2009).

6.3.4.2 Sites of National Importance

In Ireland, sites of national importance for nature conservation are designated as Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) under the Wildlife Acts 1976 to 2021, as amended. NHAs are areas considered important for the habitats present or which hold species of plants and animals whose habitat needs protection. A list of pNHAs was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated. Prior to statutory designation, pNHAs are subject to limited protection including in the areas of agri-environmental farm planning schemes, certain forest service requirements pertaining to payment of afforestation grants and recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

The proposed development site does not lie within the boundary of any NHA or pNHA site. Sites of national importance within the ZOI of the proposed development have been identified and listed in Table 6-4 and Table 6-5 and those in the immediate environs of the Proposed development site are shown in Figure 6-8.

Table 6-4: NHA sites within 15km of the proposed development site

Designated Site	Site Code	Features of Interest[17]	Proximity and connection to proposed development site
Woodcock Hill Bog NHA	002402	Woodcock Hill Bog NHA is a site of considerable conservation significance comprising upland blanket bog on the low- and mid-slopes and wet heath on the summit.	The NHA is located *c.* 1.1km to the west of the proposed development site. There is no hydrological link connecting the proposed development site to the NHA.
Gortacullin Bog NHA	002401	Gortacullin Bog NHA is a site of considerable conservation significance containing upland blanket bog and wet heath. The site supports a good diversity of blanket bog microhabitats, including hummock/hollow complexes, flushes and regenerating cutover with willow and birch scrub. Red Grouse, an Irish Red Data Book species that is becoming increasingly rare in Ireland, has been recorded on the site.	The NHA is located *c.* 5.5km to the northeast of the proposed development site. There is no hydrological/ecological link connecting the proposed development site to the NHA.
Doon Lough NHA	000337	Doon Lough Bog NHA is a site of considerable conservation significance, comprising as it does, a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. The site also includes a large lake system with a variety of fringing habitats, which include scrub, woodland, marsh, and wet grassland.	The NHA is located *c.* 8.6km to the north of the proposed development site. There is no hydrological link connecting the proposed development site to the NHA.
Cloonloum More Bog NHA	002307	Cloonloum More Bog NHA is a site of considerable conservation significance comprising as it does a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. A small lake, Lough Gara, is included at the south of the site.	The NHA is located *c.* 11.5km to the north of the proposed development site. There is no hydrological link connecting the proposed development site to the NHA.

[17] Description of sites taken from NHA Site Synopsises [https://www.npws.ie/protected-sites/nha]

Table 6-5: pNHA sites within a 15km radius of the proposed development site

Core Designated Site	Site Code	Features of Interest[18]	Proximity and connection to study area
Knockalisheen Marsh	002001	The majority of the site is encompassed within the Lower River Shannon SAC (002165). The site is split across two areas. The larger of the two areas is dominated by wet grassland and fen habitat while the smaller area is primarily comprised of reed-beds. No information is available on the NPWS website for this site.	The NHA is located *c.* 0.9km to the south of the proposed development site. There is a hydrological connection linking the study area to this pNHA via the watercourses that drain the east section of the proposed development site as these watercourses flow through the marsh habitat before flowing into the Lower Shannon Estuary.
Fergus Estuary and Inner Shannon, North Shore	002048	The site is a large estuarine complex that forms an essential part of the north shore of both the Lower River Shannon SAC (002165) and the River Shannon and River Fergus SPA (004077). The site comprises a range of wetland habitats including intertidal mud flats, marshlands and reed-beds. The site is considered to be of ornithological importance for waterbirds. No information is available on the NPWS website for this site.	The NHA is located *c.* 4.3km to the southwest of the proposed development site. There is a hydrological connection linking the proposed development site to this pNHA via the watercourses that drain the west section of the study area to the Crompaun Stream as this watercourse flows through the estuary habitat before entering the Lower Shannon Estuary.
Cloonlara House	000028	The site comprises a three-story domestic dwelling which houses a significant Leisler's bat roost during the summer months.	The pNHA is located *c.* 4.6km to the southeast of the proposed development site. Bat mitigation for Ireland notes that Leisler's bat frequently travel >5km (Marnell *et al.,* 2022). The bat survey report noted Leisler bat passes comprised 7.2% of all registrations during passive surveying. Consequently, there is a potential ecological link connecting the study area to the pNHA.
Glenomra Wood	001013	This site is encompassed within Glenomra Wood SAC (001013) and is a good example of a deciduous semi-natural woodland. The woodland is of a type listed on Annex I of the E.U. Habitats Directive. The dominant tree species here is downy birch *Betula pubescens*, with oak *Quercus petraea*, ash *Fraxinus excelsior* and beech *Fagus sylvatica* present throughout.	The pNHA is located c. 5.5km to the northeast of the proposed development site. There is no ecological link connecting the proposed development site to the pNHA.
Garrannon Wood	001012	The site comprises a mature and intact woodland where the dominant trees are oak *Quercus* spp., with downy birch and hazel *Corylus avellana* occurring in places.	The pNHA is located *c.* 5.7km to the west of the proposed development site. There is no ecological link connecting the study area to the pNHA.
Inner Shannon Estuary – South Shore	000435	The site is a large estuarine complex that forms an essential part of the south shore of both the Lower River Shannon SAC (002165) and the River Shannon and River Fergus SPA (004077). The site comprises a range of wetland habitats including intertidal mud flats, marshlands and reed-beds. The site is considered to be of ornithological importance for waterbirds. No information is available on the NPWS website for this site.	The NHA is located *c.* 5.9km to the southwest of the proposed development site. There is a hydrological connection linking the study area to this pNHA via the watercourses that drain the proposed development site that ultimately enter the Shannon Estuary.

[18] Description of sites taken from pNHA Site Synopsises [https://www.npws.ie/sites/default/files/general/pNHA_Site_Synopsis_Portfolio.pdf]

Core Designated Site	Site Code	Features of Interest[18]	Proximity and connection to study area
Castle Lake	000239	The site contains a diversity of wetland and woodland habitats including lake habitats, areas of marshland and wet grassland, reed-beds and mature woodland. The various habitats within the site are connected by the Owenogarney River.	The pNHA is located *c.* 6.4km to the northwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Danes Hole, Poulnalecka	000030	This site is encompassed by Danes Hole, Poulnalecka SAC. No information is available on the NPWS website for this site.	The pNHA is located *c.* 7.2km to the north of the proposed development site. There is no ecological link connecting the proposed development site to the pNHA.
Castleconnell (Domestic Dwelling, Occupied)	000433	No information is available on the NPWS website for this site.	The pNHA is located *c.* 7.5km to the southeast of the proposed development site. Based on the distance (7.5km) from the proposed development and in consideration of core sustenance zones for bats as described in Collins (2016), it is considered that there is no ecological link connecting the proposed development site to the pNHA.
Loughmore Common Turlough	000438	The site comprises a turlough and associated wetland habitats that flood during the winter months. The site is of ornithological importance by providing suitable winter habitat for lapwing *Vanellus vanellus*, golden plover *Pluvialis apricaria* and snipe *Gallinago gallinago.*	The pNHA is located *c*. 9.4km to the south of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Rosroe Lough	002054	This site forms part of a series of small lakes in east Clare. The site comprises a series of small lakes, peatland habitat including raised bog, holly dominated scrub and grassland habitats. The site has been a refuge for coot *Fulica atra*, little grebe *Tachybaptus ruficollis* and great crested grebe *Podiceps cristatus*.	The pNHA is located *c*. 10.3km to the northwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Lough Cullaunyheeda	001017	This site forms part of a series of small lakes in east Clare. The site is considered to be of ornithological importance by holding nationally important numbers of waterbirds including lapwing, coot, great crested grebe, wigeon *Anas ibernic*, tufted duck *Aythya fuligula*, golden eye *Bucephala clangula*, teal *Anas crecca*, pochard *Aythya farina*.	The pNHA is located *c*. 10.6km to the northwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Fin Lough (Clare)	001010	This site forms part of a series of small lakes in east Clare and is located directly west of Rosroe lough. The lake is of ornithological importance for waterbirds and comprises a range of habitats including scrub, peatland and fen habitat.	The pNHA is located *c*. 11.6km to the northwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Dromore & Bleach Loughs	001030	The site primarily comprises the low-lying Dromore and Bleach Lake which are actively fished. Associated habitat includes peatland, fen and scrub.	The pNHA is located *c*. 13.2km to the southwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.
Ballycar Lough	000015	This site forms part of a series of small lakes in east Clare and is located directly west of Fin Lough. The site comprises a calcareous lake with associated fringe habitats including reed-beds, fens and marshland habitats.	The pNHA is located *c*. 13.3km to the northwest of the proposed development site. There is no hydrological link connecting the proposed development site to the pNHA.

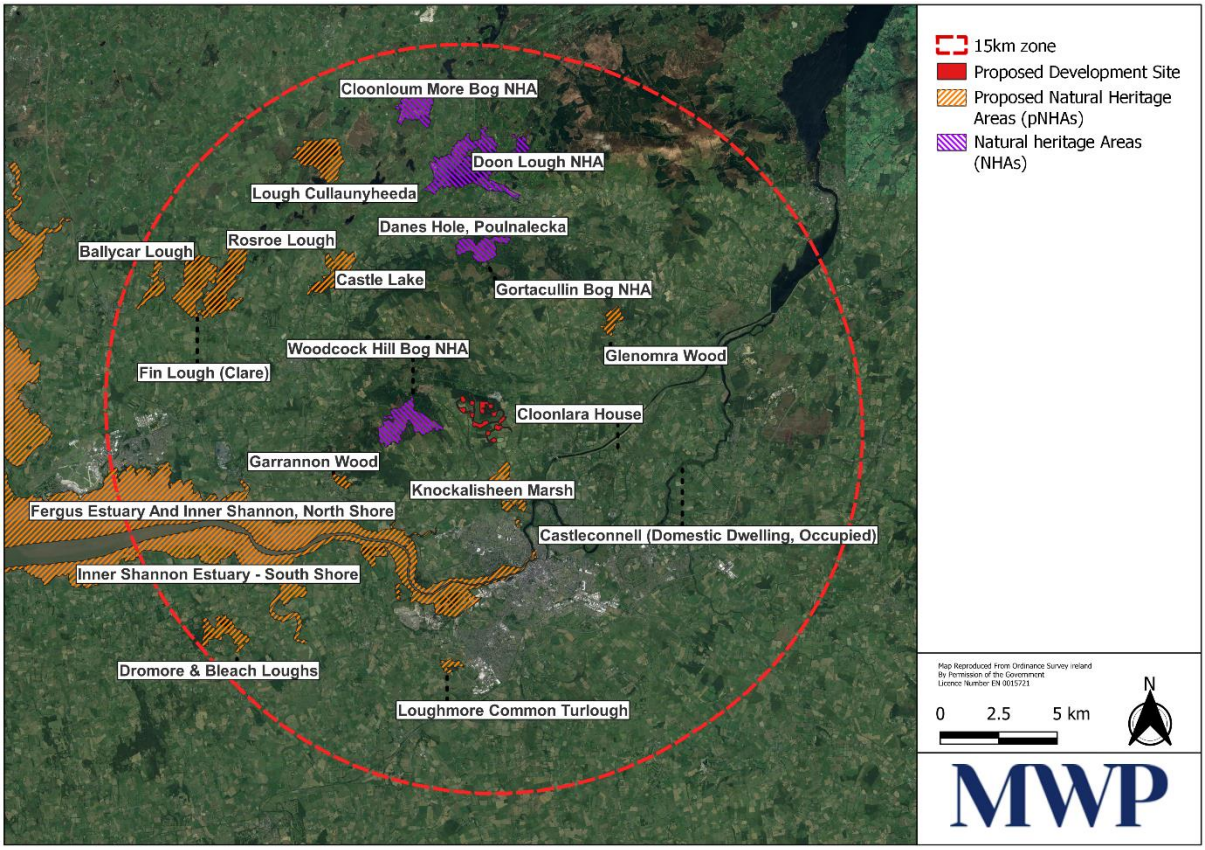

Figure 6-8: NHAs and pNHAs within 15km of the proposed development site

6.3.4.3 Additional Sites

Ramsar Sites

There are no Ramsar sites within a 15km radius of the study area[19].

Important Bird and Biodiversity Areas (IBAs)

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programmes.

An on-line search was undertaken to search for IBA sites potentially located within the ZOI of the Proposed development. The study area of the proposed development is c. 4km north of the 'Shannon and Fergus Estuaries IBA' (Site Code: IE068)[20]. This IBA site encompasses 16,718 ha and is described as a large estuarine complex with islands, saltmarshes, mudflats, raised saltmarsh and wet meadows. This is one of the most important sites in Ireland for wintering and migrating waterfowl, supporting 10 species in numbers of international importance and

[19] https://rsis.ramsar.org/
[20] BirdLife Data Zone

13 species occur in numbers of national importance[21]. The site overlaps with the River Shannon and River Fergus Estuaries SPA (004077) and the Lower River Shannon SAC (002165).

There are no additional IBA sites within a 15km radius of the study area.

Salmonid Rivers

Water channels in Ireland may be designated as a Salmonid River in line with the European Communities (Quality of Salmonid Waters) Regulations, 1988. None of the watercourses within or hydrologically connected to the study area are designated as Salmonid Rivers[22], thought he species is known to occur in the River Shannon.

6.3.5 Habitats

Habitats within the Proposed development area were classified according to Fossitt, 2000. A habitat map is presented below in **Figure 6-9** and **Figure 6-10** (refer to **Section 6.3.5.2**). A Biodiversity Enhancement Management Plan is included in **Appendix 6E** outlining proposed management and enhancement measures for various habitats and species within the study area.

6.3.5.1 Desk Study

Article 17 NPWS Dataset

The NPWS Article 17 datasets for Annex I habitats were downloaded from the NPWS website and reviewed. These spatial datasets documented the occurrence of the Annex I habitats outlined below. However, these datasets are mapped to a 10km grid cell resolution only and do not show the regions occupied or extent of these habitats within the hectad.

Within the study area itself, the Annex I habitat, Northern Atlantic wet heaths with *Erica tetralix* (4010), is recorded in the northern section, bordered by conifer plantation directly to the northwest, northeast, and east. The Annex I habitat, Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0), is recorded bounding the Crompaun [East] watercourse and its tributaries; Cappateemore east and the Glennagross however, this is recorded outside of the development boundary of the proposed works at Ballycar.

Heritage Maps

Heritage Maps, maintained by the Heritage Council, is an online map viewer providing information on built, cultural and natural heritage. Local Authority habitat surveys, in this case habitat surveys commissioned by Clare County Council in 2004[23], were accessed via the map viewer in order to review existing habitat data recorded within and connected to the study area. These surveys classified a number of habitats within the EIA study area according to Fossitt (2000). It is noted that the surveys were not comprehensive, with some areas within the study area unmapped. Recorded habitats considered to be of high ecological value within the study area include 'Wet heath (HH3)', 'Oak-birch-holly woodland (WN1)', and 'Wet willow-alder-ash woodland (WN6)'.

6.3.5.2 Field Surveys

Spoil and Bare Ground (ED2)

Small areas of this habitat type are found within the study area (see **Plate 1**). This habitat was identified within a field (classified as 'Improved agricultural grassland (GA1)', where a farm track crossing the 'Cappateemore_East'

[21] http://datazone.birdlife.org/site/factsheet/shannon-and-fergus-estuaries-iba-ireland/details
[22] EPA Maps
[23] http://heritagemaps.ie/documents/Clare_HabitatsSurvey.pdf

watercourse was recently installed, with spoil heaps and recently-dug areas recorded at the time of the field survey. Other areas of this habitat type comprised bare ground associated with cattle containment/ high levels of cattle activity, resulting in prevention of vegetation growth and presence of bare soil.

This habitat type does not correspond to any EU Annex I habitats. 0.15ha of this habitat will be removed to facilitate the development.

Plate 6-1: Spoil and Bare Ground (ED2) habitat located within the study area

Active Quarries and Mines (ED4)

A small, old borrow pit is located in the northwest of the study area. This area somewhat corresponds to this habitat type, in that vegetation has not colonised the area and the piles of rock (pencil) are loose and unstable.

This habitat type does not correspond to any EU Annex I habitats. This habitat type will not be removed to facilitate the development.

Buildings and Artificial Surfaces (BL3)

This habitat type is present within the study area as buildings/structures, access tracks and public roads. Farm holdings (farmyards, steel sheds, stone sheds, lean-tos, etc.) are mostly located towards the edge of the study area to the south and to the west. The farm holding to the west also includes a private residential dwelling, with other residential dwellings adjoining the study area to the south and to the east. The majority of the structures associated with the farm holdings and residential buildings are highly modified and have the capacity to support very little native floral vegetation outside of some recolonising species such as dandelions (*Taraxacum* spp.), herb

Robert (*Geranium robertianum*), willowherb (*Epilobium* spp.), creeping buttercup (*Ranunculus repens*) and ragwort (*Senecio jacobaea*).

A derelict cottage and associated farm shed in similar condition, are located in the northeast of the study area. The small clearing between the two structures is likely used at times to house cattle while the structures themselves contained with debris. The structures and clearing are partially enclosed by stone walls (classified as 'Stone walls and other stonework (BL1)') and old metal gates. These structures are overgrown with bramble (*Rubus fruticosus* agg), ivy (*Hedera hibernica*) and nettles (*Urtica dioica)*.

A small concrete structure, the remains of an old tower, is located in the centre of a field (classified as 'Wet grassland (GS4)' habitat) north of T9 towards the centre of the study area. This structure is not catalogued on any database or programme and it being composed of concrete indicates it is of modern construction.

This habitat type does not correspond to any EU Annex I habitats. None of the structures listed above will be removed to facilitate the development of the wind farm.

The remaining areas of this habitat type include farm tracks within the wind farm site and public roads within the wider study area. These areas comprise quarried stone and asphalt roads respectively. 0.58ha of this habitat type will be used to facilitate the development.

Plate 6-2: Derelict building, an example of Buildings and Artificial Surfaces (BL3) on site

Plate 6-3: Access track, corresponding to Buildings and Artificial Surfaces (BL3).

Improved Agricultural Grassland (GA1)

Along with 'Conifer plantation (WD4)', this habitat type is one of the dominant habitat types within the study area, particularly at lower elevations in the southwest and southeast. This habitat type is typically species-poor and dominated by rye grasses (*Lolium* spp.) due to intensive management of pasture for cattle grazing and silage harvesting. During field surveys, species recorded, apart from *Lolium*, included creeping buttercup (*Ranunculus repens*), docks (*Rumex* spp.), white clover (*Trifolium repens*), ribwort plantain (*Plantago lanceolata*), daisy (*Bellis perennis*), and dandelions (*Taraxacum* spp.).

This habitat type does not correspond to any EU Habitats Directive Annex I habitats. Areas of this habitat will be removed to facilitate development of the wind farm.

In the northern parts of the study area, this habitat was noted to occur in mosaic with 'Dry-humid acid grassland (GS3)', where the former was reverting from improvement. In these areas, moss cover was more apparent as was the presence of species such as devil's bit scabious (*Succisa pratensis*), sheep's sorrel (*Rumex acetosella*) and grasses including fescues (*Festuca* spp.) and bents (*Agrostis* spp.). While areas of GA1/GS3 mosaic contain a higher diversity of floral species, signs of long-term cattle activity (poaching, dung, etc.) with extensive trampling and signs of over-grazing and pockets of exposed soil were also noted. These areas of GA1/GS3 habitat do not correspond to the EU Habitats Directive Annex I habitat 'Species-rich *Nardus* grasslands [6230]' or any other Annex I habitat type.

Some areas of GA1 were found to be transitioning to 'Wet grassland (GS4)', particularly within more wet and water-logged areas. The presence of this habitat mosaic was indicated by a higher abundance of rushes (*Juncus*

spp.) as well as by the presence of floral species such as lesser spearwort (*Ranunculus flammula*), cuckooflower (*Cardamine pratensis*), clovers (*Trifolium* spp.), and buttercups (*Ranunculus* spp.). These areas of GA1/GS4 habitat do not correspond to the EU Habitats Directive Annex I habitat 'Species-rich *Nardus* grasslands [6230]'.

The habitat mosaics listed above are used as rough grazing for cattle. This habitat type, or the mosaics with which it is associated with within the study area, do not correspond to any EU Habitats Directive Annex I habitats. Areas of this habitat (7.27ha) and mosaics of this habitat (approximately 4ha) will be removed to facilitate development of the wind farm. This habitat type is also present at the location of the temporary works at the junction of the R464 and L3056, with temporary removal required of approx. 0.04ha required.

Plate 6-4: Improved agricultural grassland habitat (GA1) at site

Dry-humid Acid Grassland (GS3)

This habitat type is found in the more upland sections of the study area, frequently in mosaic with other grassland habitats such as 'Improved agricultural grassland (GA1)', as outlined in the previous section, and 'Wet grassland (GS4)' where the ground is more waterlogged (see Plate 5). The majority of areas where this habitat occurs show signs of degradation brought on by over-grazing and scrub encroachment. A section of grassland located outside the proposed development area, south of the area of 'Wet heath (HH3)' habitat near the centre of the site, appeared the most intact and species-rich at the time of surveys. As it is outside the proposed development area, it will not be removed/altered.

Species composition in this habitat comprised grasses such as crested dog's-tail (*Cynosurus cristatus*), sweet vernal grass (*Anthoxanthum odoratum*) and common bent (*Agrostis capillaris*), and broadleaved herbs including tormentil (*Potentilla erecta*), sheep's sorrel (*Rumex acetosella*), yarrow (*Achillea millefolium*), lousewort

(*Pedicularis sylvatica*), purple moor grass (*Molinia caerulea*), common fleabane (*Pulicaria dysenterica*), ribwort plantain (*Plantago lanceolata*), birds-foot trefoil (*Lotus corniculatus*), and common spotted orchid (*Dactylorhiza fuchsii subsp. Fuchsia).* Devil's-bit scabious *(Succisa pratensis)* was also recorded, being particularly abundant south of the area of 'Wet heath (HH3)' habitat near the centre of the study area. Moss cover was often extensive, particularly further upland.

'Dry-humid acid grassland (GS3)' can contain links to the priority EU Annex I habitat-type:

- Species-rich *Nardus* grasslands on siliceous substrates in mountain areas (6230)'

'Dry-humid acid grassland (GS3)' habitat occurring within the study area does not correspond to this EU Habitats Directive Annex I habitat. While there will be removal of approximately 2.22ha of this habitat type to facilitate the development of the proposed wind farm, the most species-rich area of this habitat type, located south of the area of 'Wet heath (HH3)', is outside the area of proposed works and will not be impacted upon by the proposed development.

Plate 6-5: Dry-humid Acid Grassland (GS3) located in the northwest of the site

Wet Grassland (GS4)

This grassland habitat type occurs throughout the study area, frequently in mosaic with the grassland habitat types 'Improved agricultural grassland (GA1)' and 'Dry-humid acid grassland (GS3)', outlined above. In a field just southwest of the centre of the study site, this grassland habitat occurs as a 'Wet grassland (GS4)/Scrub (WS1)' mix. This area, which is primarily utilized as grazing, was noted to be transitioning to scrub during field surveys (see Plate 6).

Species richness varied between areas of this habitat type. In the northwest section of the study area, a band of GS4 habitat was recorded flanked by 'Upland blanket bog (PB2)/ Wet heath (HH3)' habitat to the north and fields of 'Improved agricultural grassland (GA1)' to the south. Here, this habitat type is considered to be rank, characterised by cattle activity and an abundance of rushes (*Juncus* spp.), and is considered to be species-poor overall. It is likely that GS4 occurs here due to the 'improvement' of the limited peatland habitats to the north for agriculture. Species diversity is also considered to be low where GS4 occurs with GA1, due to the dominance of *Juncus* spp. and rye grasses (*Lolium* spp.) in these areas. Where Upland blanket bog (PB2) and Wet Heath (HH3) occur together in the northern aspect of the site, these habitats have been excluded from the development area.

A species-rich area of this habitat type is located in a field north of the proposed location for T9, comprising grass species such as Yorkshire fog (*Holcus lanatus*), crested dog's-tail (*Cynosurus cristatus*), rough meadow-grass (*Poa trivialis*), and sweet vernal grass (*Anthoxanthum odoratum*). Other species recorded include purple moor-grass *(Molinia caerulea*), marsh thistle (*Cirsium palustre*), meadow thistle (*Cirsium dissectum*), buttercups (Ranunculus spp.), lesser spearwort (*Ranunculus flammula*), forget-me-not (*Myosotis arvensis*), chickweed (*Stellaria media*), bugle (*Ajuga reptans*), germander speedwell (*Veronica chamaedrys)*, yarrow (*Achillea millefolium*), tormentil (*Potentilla erecta*) and sedges (*Carex nigra*). Other species of note recorded here include an abundance of devil's-bit scabious (*Succisa pratensis*) and common spotted orchid (*Dactylorhiza fuchsii* subsp*. Fuchsia)*, which was recorded as Infrequent. While cattle activity was recorded here, signs of over-grazing were not recorded.

Another area of species-rich wet grassland is located east of the limited peatland habitat mosaic 'Upland blanket bog (PB2)/ Wet heath (HH3)', directly adjacent to a block of 'Conifer plantation (WD4)' to the north. Similar species to those in the area described above were recorded, including devil's-bit scabious and orchid species*.,* although no meadow thistle (which can be an indicator of the EU Annex I habitat '*Molinia* meadows') was recorded here.

Wet grassland can contain links to the EU Annex I habitat:

- *Molinia* meadows on calcareous, peaty, or clayey-silt laden soils (*Molinion caeruleae*) (6410)

The majority of areas containing this habitat type are species-poor and occur in mosaic with 'Improved agricultural grassland (GA1)', and do not correspond with the EU Habitats Directive Annex I habitat, outlined above. Sections of this habitat which do not contain links to annex I habitat will be removed in order to facilitate the development of the proposed wind farm.

Separate to this area, a species-rich area of wet grassland habitat, located north of the proposed location for T9, described in detail above, has characteristic species associated with the EU Annex I habitat 'Molinia meadows', with seven 'Positive Indicator Species' recorded during the ecological surveys in this area, including meadow thistle and common spotted orchid, which are also classed as a 'High Quality Indicator Species'[24]. These species-rich areas of 'Wet grassland (GS4)' located north of the proposed location for T9 have been excluded from the development area and therefore will not be removed to facilitate the development of the wind farm.

Separately from the species-rich area of grassland, a very small mosaic of Wet Grassland habitat of limited species richness will be removed (0.0009ha) to facilitate development of the wind farm.

[24] https://bsbi.org/wp-content/uploads/dlm_uploads/2021/11/Molinia_Meadows_6410_Updated2021.pdf

Plate 6-6: Example of Wet Grassland habitat (GS4) at site

Conifer Plantation (WD4)

This habitat is one of the dominant habitat types within the study area, along with 'Improved agricultural grassland (GA1)'. It occurs throughout the study area, particularly in areas in the centre and north of the study area (see Plate 7). Dominant species are sitka spruce (*Picea sitchensis*) and lodge pole pine (*Pinus contorta*). This habitat comprises various age groups including semi-mature and mature conifer plantation. Within the mature sections of forestry, the closed canopies and dense blanket of pine needles has resulted in poor woodland flora diversity. In some areas, sphagnum mosses (*Sphagnum* spp.) carpet the woodland floor.

Sections of conifer plantation within the study area have collapsed, with trees fallen or failed, particularly in northwest sections. In these areas, floral species associated with scrub habitat have encroached, including willows (*Salix* spp.), gorse (*Ulex europaeus*), bramble (*Rubus fruticosus* agg.), and bracken (*Pteridium aquilinum*). Where canopy cover has been opened up by weak growth, or at fire breaks between sections of conifer plantation, fragmented and narrow areas of heath habitat exist, as indicated by the presence of species such as purple moor-grass *(Molinia caerulea*) and ling heather (*Calluna vulgaris*), although many of these areas have been overtaken by scrub species such as bramble, gorse and willow, especially at lower elevations. Rows (single or narrow blocks) of deciduous trees are often planted along the edges of this habitat type to increase biodiversity. Species planted for this reason within the study area include beech (*Fagus sylvatica*) and alder (*Alnus glutinosa*).

This habitat type has been planted for commercial forestry, and diverse flora is absent. This habitat type does not correspond to any EU Annex I habitats. An area of this habitat will be removed (15.97ha) to facilitate development of the wind farm.

Plate 6-7: Conifer plantation habitat (WD4) occurs at much of the site

Dense Bracken (HD1)

While bracken was recorded throughout the site, particularly as part of scrub and hedgerows, three areas within the site were classified as 'dense bracken (HD1)', as it was noted that bracken cover at these locations exceeded 50% of vegetation present in these areas. In the northeast of the study area, this habitat dominates an area that had been previously planted for conifer forestry but which has since failed, with bracken encroaching and becoming the dominant vegetation present. Other floral species present here include bramble. Another patch of this habitat is present near an old tin farm shed used to house cattle, situated in the east of the study area. A third bracken-dominated area was recorded between 'Dry humid grassland (GS3)' and 'Improved agricultural grassland (GA1)' habitats, occurring in the immediate environs of the proposed location of Turbine 4 (T4). Other vegetation present included bramble, nettle, and grasses such as cock's foot and Yorkshire fog. This habitat type does not correspond to any EU Annex I habitats. Areas of this habitat type (0.11ha) and mosaics of this habitat with conifer plantation (0.09ha) will be removed to facilitate the development of the wind farm.

Scrub (WS1)

Pockets of 'Scrub (WS1)' occur throughout the study area. These areas of scrub are mainly associated with the edges of conifer plantation, within areas of collapsed forestry and fire breaks. This habitat, mainly in the form of gorse-dominated scrub also occurs within the less 'improved' areas of grassland, particularly within areas of 'Dry-humid acid grassland (GS3)' in the north and northwest areas of the site. In some cases, species such as bramble, gorse and willow (*Salix* spp.) form patches of scrub extending away from the hedgerows. This habitat was also found to occur in mosaic with 'Wet grassland (GS4)', as outlined above. While the majority of these areas were

mapped using data gathered from desk studies and field surveys, some areas of this habitat were too small to be mapped. Some sections of scrub were impenetrable during the time of survey. This habitat type can be locally important for a range of faunal species for nesting, foraging and commuting purposes.

This habitat type does not correspond to any EU Annex I habitats. A section of this habitat type will be removed (1.62ha) to facilitate the development of the wind farm. A Biodiversity Enhancement Management Plan is included in **Appendix 6E** outlining proposed management and enhancement measures for various habitats and species within the study area.

Hedgerows (WL1)/Treelines (WL2)

'Hedgerows (WL1)'and 'Treelines (WL2)' are located within the study area, delineating field boundaries and bordering access tracks and adjoining drainage ditches (see **Plate 6-8** and **Plate 6-9**). These habitat types generally link up, sometimes transitioning from one to the other along the same linear feature, forming a network extending outside the study area to the wider landscape.

Treelines (WL2) habitat mainly comprises single rows of sitka spruce (*Picea sitchensis*), that were likely planted as wind breakers and field boundaries.

Hedgerows are typically comprised of willows (*Salix* spp.), blackthorn (*Prunus Spinosa*), hawthorn (*Crataegus monogyna),* bramble (*Rubus fructicosus*), and gorse (*Ulex europaeus*). Large mature trees were more frequent in the well-established species-rich hedgerows located in the centre, southwest and northeast sections of the study area. These tree species included ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*), oak (*Quercus rubra*), beech (*Fagus sylvatica*), and hazel (*Corylus avellana*), with the occasional rowan (*Sorbus aucuparia*) and holly (*Ilex Aquifolium*) trees present. Other species recorded within the species-rich hedgerows include foxglove (*Digitalis purpurea*), nettle (*Urtica dioica*), ivy (*Hedera helix*), harts-tongue fern (*Asplenium scolopendrium*), Yorkshire fog (*Holcus lanatus*), cock's-foot (*Dactylis glomerata*), cleavers (*Galium aparine*), bracken (*Pteridium aquilinum*), honeysuckle (*Lonicera periclymenum*), Herb-Robert (*Geranium robertanium*), and greater stitchwort (*Stellaria holostea).* Non-native species such as fuchsia (*Fuchsia magellanica*), montbretia (*Crocosmia x crocosmiiflora*) and cherry laurel (*Prunus laurocerasus*) were recorded occasionally.

While stonewalls do occur occasionally within the study area, they have become so overgrown by hedgerow species that they no longer correspond to the Fossitt (2000) habitat-type 'Stone walls and other stonework (BL1)' classification. The species richness of 'Hedgerows (WL1)' habitat varied widely throughout the study area. Species-poor hedgerows were typically highly managed.

This habitat type does not correspond to any EU Annex I habitats. Approximately 849m of hedgerow habitat and 15m of treeline habitat will be removed to facilitate the development of the wind farm. Approximately 30m of hedgerow will be temporarily removed at the junction of the R464 and L3056 to facilitate turbine delivery.

Plate 6-8: Hedgerow (WL1) habitats delineate field boundaries throughout the study area

Plate 6-9: Treeline habitat (WL2) delineating field boundaries, often occurring in combination with Hedgerows (WL1)

Mixed Broadleaf Woodland (WD1)

This habitat type occurs throughout the study area either as individual stands or bounding watercourses (see Plate 6-10). The largest stand of this woodland habitat comprises an ash (*Fraxinus* excelsior) plantation and occurs within the centre of the study area with grassland and scrub habitats to the north, south and west and conifer plantation to the east. The corridors immediately surrounding the plantation have become overgrown with bramble. Other species recorded within this corridor included enchanter's nightshade (*Circaea lutetiana*), creeping buttercup (*Ranunculus repens*), herb Robert (*Geranium robertianum)*, alder (*Alnus glutinosa*), foxglove, hawthorn (*Crataegus monogyna*), and honeysuckle (*Lonicera periclymenum*). As the plantation was enclosed by high deer fencing, the plantation was not accessible at the time of surveys. Aerial mapping was consulted to determine any features within the plantation such as a change in habitat classification, however it was determined that the enclosed area was likely mixed broadleaf woodland throughout, with edge species likely representing the species throughout the plantation.

A small stand of woodland is located south of the ash plantation. This habitat comprises broadleaved species such as beech (*Fagus sylvatica*), oak (*Quercus robur*) hawthorn (*Crataegus monogyna*) and sycamore (*Acer pseudoplatanus*). Floral vegetation recorded includes wood sanicle (*Sanicula europaea)*, germander speedwell (*Veronica chamaedrys)*, bluebell (*Hyacinthoides non-scripta*), dog violet (*Viola riviniana*), enchanter's nightshade (*Circaea lutetiana*), meadow buttercup (*Ranunculus acris*) and ivy (*Hedera Hibernica*), with invading bramble scrub in the north. The subcanopy layer of this stand is poorly developed, likely due to cattle poaching and over-grazing by cattle and deer. This woodland stand is also recorded by historic 25" OSI mapping (1897-1913) on Geohive map-viewer[25].

Areas of this habitat type bound the upper section of the 'Cappateemore_East' watercourse where broadleaved species such as ash (*Fraxinus* excelsior), sycamore (*Acer pseudoplatanus*) and beech (*Fagus sylvatica*), dominate, with willows (*Salix* spp.) and hazel (*Corylus avellana*) also recorded. The ground flora layer comprises enchanter's nightshade (*Circaea lutetiana*), Herb-Robert (*Geranium robertanium*), honeysuckle (*Lonicera periclymenum*), ivy (*Hedera ibernica*) and yellow pimpernel (*Lysimachia nemorum*), with some invading bramble. No signs of cattle activity were recorded here during field surveys. A very limited area of this woodland will be removed (0.02ha) to facilitate development of the wind farm. Species of note towards the lower end of this habitat within the study area include oak (*Quercus robur*), birch (*Betula pubescens*) and holly (*Ilex aquifolium*). Other broadleaf species include the non-native species sycamore (*Acer pseudoplatanus*) and beech (*Fagus sylvatica*).

Other species recorded include bluebells (*Hyacinthoides non-scripta*), ivy (*Hedera helix*) and pignut (*Conopodium majus*). Ground flora and the subcanopy layer are poorly developed with large pockets of bare soil, likely caused by heavy cattle poaching. Further, there is a newly built farm track spanning c. 15m across the 'Cappateemore_East' watercourse to the west.

There is an area of this type of woodland habitat bounding the 'East Ballycannan' watercourse, located at the southeast extent of the study area. This woodland habitat exists on a steep incline, sloping east towards the watercourse. The dominant broadleaf species here are hazel and ash, while willow and sycamore were also recorded. The ground flora was lush with fern species such as shield ferns (*Polystichum* spp.), hart's tongue (*Asplenium* spp.), and scaly male fern (*Dryopteris affinis*). Other ground flora recorded included lords and ladies (*Arum maculatum*), common dog violet (*Viola riviniana*), wood avens (*Geum urbanum*), sanicle (*Sanicula europaea*), bluebell (*Hyacinthoides non-scriptus*), and ivy (*Hedera hibernica*). A section of this habitat type has been cleared, in a likely effort to increase the area for agriculture. This section would have originally connected to hedgerows running north to south which have also since been removed.

[25] https://geohive.maps.arcgis.com/apps/webappviewer/index.html?id=9def898f708b47f19a8d8b7088a100c4

This habitat type does not correspond to any EU Annex I habitats. A section of this habitat (0.05ha) will be removed in order to facilitate construction (see Figure 6-9).

Plate 6-10: Example of Mixed Broadleaf Woodland habitat (WN1), along the banks of the East Ballyannnan stream within the study area.

Recently felled woodland (WS5)

Recently felled woodland occurs in the environs of the new loop-in towers, in the northernmost reaches of the proposed grid connection (see Plate 6-11). This area was previously planted with sitka spruce and has been recently felled. The ground was highly disturbed when surveyed in July 2023 and prone to erosion during and after rainfall events, with increased suspended solids in the drainage pathways constructed as part of standard commercial planting operations. The moderate gradients were considered especially susceptible to erosion and water heavily laden with clay particles was observed emanating from such denuded areas. Some recolonisation by pioneer native flora had begun, including foxglove, soft rush, bramble and scaly male fern.

Felling was also observed in the commercial plantation in the environs of proposed turbine T7 during July 2023, but it was not possible to survey the extent of this area while machinery were operating for health and safety reasons. It is likely that all the commercial forestry was intended for felling as it was all the same stand of same age. The ecological value of both mature and recently felled commercial woodland are broadly equivalent in any case, both being of low ecological value. Referring to the licence parcel for felling in this area (CN84199) the Forest Type (FT) is referred to as some "3 – 10% diverse mixed" composed of primarily sitka spruce and additional

broadleaves for each of the four parcels. The licence details include reference to biodiversity and water protection; however it is assumed these were not pursued as denoted by 'N' in the licence viewer[26].

Plate 6-11: Recently felled woodland (WS5) in the northern area of the proposed development site.

Wet Heath (HH3)

This habitat was recorded in the north of the study area bordered by 'Conifer plantation (WD4)' to the northwest, northeast and east, and 'Dry-humid acid grassland (GS3)' to the west and to the south. This area of habitat comprises a sloping field to the south and a wide fire break between two sections of conifer forestry sloping to the northwest. The field section is punctuated by pockets of gorse and willow scrub, particularly along the east and northeast boundary shared with forestry. Signs of cattle activity were apparent within the field section but not recorded within the fire break section at the time of survey. It is likely that this habitat type extends through the firebreak to the east, but this area was not accessible at the time of survey.

The heath habitat comprises of three heather species; ling heather (*Calluna vulgaris),* bell heather (*Erica cinerea*), and cross-leaved heath (*Erica tetralix*), with ling being the most abundant. Purple moor grass (*Molinia caerulea*) is a dominant species within the field section of this habitat type with deergrass (*Trichophorum caespitosum*) more abundant in the fire break section. Other species recorded included heath rush (*Juncus squarrosus*), bilberry (*Vaccinium myrtillus*), tormentil (*Potentilla erecta*), bugle (*Ajuga reptans*), heath milkwort (*Polygala serpyllifolia),* and green-ribbed sedge (*Carex binervis*). Pockets of *Sphagnum* mosses were also recorded.

It is likely that this habitat extended further south but has since transitioned to grassland, classified as 'Dry-humid acid grassland (GS3)' in mosaic with 'Wet grassland (GS4)' in parts due to farming activity, with a decline in heather

[26] https://flv.apps.services.agriculture.gov.ie/ (accessed on 6/12/2023)

species and an increase in species such as bents (*Agrostis* spp.), sweet vernal grass (*Anthoxanthum odoratum*), meadow buttercup (*Ranunculus acris*) and thistles (*Cirsium spp*.), along the transition boundary. Should current farming practices remain, the field section of this habitat will likely continue to transition to grassland habitat.

'Wet heath (HH3)' has links to the Habitats Directive Annex I habitat type:

- Northern Atlantic wet heaths with *Erica tetralix* (4010).

Using the National Survey of Upland Habitats (Perrin et al. 2014), the vegetation community within the field section of this habitat corresponds somewhat to 'WH3 (*Calluna vulgaris - Molinia caerulea – Sphagnum capillifolium*)' while the fire break section corresponds more to the sub-community 'WH4b, *Trichophorum germanicum – Eriophorum angustifolium'* wet heath (with *Calluna vulgaris* frequent).

This habitat (both the field section and the fire break section) is considered to have links to the Annex I habitat listed above given the overlap with the Article 17 spatial dataset outlined in Section 6.3.5.1 above and the presence of the vegetative communities and sub-communities identified during field surveys. However, it is noted that this Annex I habitat is likely to be lost over time should current farming practices continue and not at the fault of the wind farm development. Regardless, this habitat is located outside the planning application boundary and will not be removed/altered to facilitate the development of the wind farm.

Upland blanket bog (PB2)/Wet heath (HH3)

This peatland habitat type, a mosaic of 'Upland blanket bog (PB2)' and 'Wet heath (HH3)', occurs within a small section in the northwest of the study area (see Plate 6-12). Encroachment of 'Wet grassland (GS4)', rank with *Juncus* spp., is apparent on all sides, particularly to the south. This grassland habitat grades into 'Dry-humid acid grassland (GS3)' to the north and 'Improved agricultural grassland (GA1)' to the south. Peat depth probing within the area of 'PB2/HH3' found that peat depths vary greatly from 0.1m – 1.0m, with deepest peat recorded towards the centre of this habitat type. The majority of peat depths in this area were recorded at <0.5m.

Species composition in this habitat comprised deergrass (*Trichophorum caespitosum*), *Cladonia* lichens, and *Sphagnum* mosses which were frequently recorded. Other species recorded included sedges (*C. panicea, C. viridula*), hare's-tail cottongrass (*Eriophorum vaginatum*), tormentil (*Potentilla erecta*) and lousewort (*Pedicularis sylvatica*). Dwarf shrubs recorded included ling (*Calluna vulgaris*), cranberry (*Vaccinium oxycoccos*) and bilberry (*Vaccinium myrtillus*), as well as cross-leaved heath (*Erica tetralix*). Purple moor grass (*Molinia caerulea*) was recorded infrequently.

The blanket bog has been greatly degraded due to efforts to 'improve' the land for cattle farming. Examples of this include attempts to dry out the land using a series of drains that crisscross the habitat type at random. The hydrology of this habitat has been somewhat affected by these drains, with dried-out pockets present during the summer months. Efforts to 'improve' the area through drainage have likely resulted in an increase in heather species, particularly ling heather. In areas affected by drainage, it is likely that this habitat will continue to transition to 'Wet heath (HH3)' habitat whereas land 'improved' for cattle farming is more likely to transition to grassland habitats. Signs of cattle activity such as trampling, over-grazing and minor pockets of exposed peat were recorded during field surveys in this area. Anecdotal evidence informed surveyors that historically peat was extracted for burning from this area and there are continuing efforts to find and reopen old drainage channels.

While greatly degraded and in mosaic with 'HH3', this habitat corresponds to some extent to the National Survey of Upland Habitats (NSUH) habitat category '*Calluna vulgaris – Eriophorum* spp.', a sub-community of the upland bog type 'BB4' (Perrin et al. 2014).

'Upland Blanket Bog (PB2)' has links to the Habitats Directive Annex I habitat types:

- Blanket bog (*if active bog) (7130);

- Depressions on peat substrates of the Rhynchosporion (7150).

In order to be considered priority habitat, according to the European Commission (2007), "The term 'active' must be taken to mean still supporting a significant area of vegetation that is normally peat forming". Peat forming vegetation include species recorded in this area; *Sphagnum* mosses and cotton grasses (*Eriophorum* spp). However, given the degradation of this habitat with drainage throughout and its gradual transition to 'Wet Heath (HH3)' due to land management (cattle access and drainage), the blanket bog habitat present here is not regarded as an EU Annex I priority habitat.

This habitat is located outside the proposed area of works and will not be removed/altered to facilitate the development of the wind farm. These areas will be fenced off to ensure no entry of machinery, access, etc.

Plate 6-12: Upland blanket bog (PB2)/Wet heath (HH3) mosaic in the background

Eroding/upland rivers (FW1)

The watercourses draining the study area are classified as 'Eroding/upland rivers (FW1)'. The location, flow direction and WFD status of these watercourses are outlined in Section 6.3.3 above as well as the map of watercourses (see Figure 6-6). The physical characteristics of selected representative sites on these watercourses are outlined in the 'Aquatic Ecology and Fish Survey Report', included in Appendix 6C.

The watercourses within the study area are mainly high gradient channels with mostly rock cobble substrates characterized by riffle pool sequences. The only aquatic vegetation recorded at the aquatic survey sites were (collectively) the bryophytes *Leptodictyum riparium, Conocephalum* sp., *Chiloscyphus polyanthos* and filamentous algae. These watercourses are impacted by excessive siltation as a consequence of agricultural land management and commercial forestry. The majority of the watercourses within the study area are deemed to be of little to no

intrinsic value to fish species, due to their small size, culverted sections, and propensity to drying out during periods of drought.

Eroding/upland rivers can have links to the EU Annex I habitat type;

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260)

The paucity of aquatic vegetation coupled with land management impacts are negative indicators of links to this EU Annex I habitat and it is regarded that this habitat type does not correspond with Annex I habitat in this case. The 110kV grid connection route crosses one watercourse, the 1st order Kilnacreagh Stream (EPA segment code 25_3206), within a conifer forestry area of the site. A bottomless culvert will be installed to carry both the access track and the cable over the crossing and no instream works will be required. This Kilnacreagh Stream flows from west to east approximately 50m to the south of the nearest proposed tower to be erected to connect to the existing overhead line. The Kilnacreagh Stream joins the 1st order Trough River (EPA code 25B06, also referred to as the Blackwater River) which flows west for ca. 5.2km until it is fed by the 3rd order Derryvinnan River. There is an unmapped watercourse near the northern extent of the proposed development site that flows into the Kilneacreagh Stream, as indicated in Plate 14, below.

Plate 6-13: Eroding/upland river habitat (FW1) – Cappateemore East Stream, an EPA registered channel.

Plate 6-14: Eroding/upland river habitat (FW1) in the north of the proposed development site after prolonged heavy rainfall – not an EPA registered channel.

Drainage ditches (FW4)

The majority of the drainage channels within the study area are dry ditches associated with field boundaries that lack wetland plants due to their moderate gradient. These drainage ditches do not correspond with the Fossitt (2000) habitat type and typically host marginal vegetation associated with 'Hedgerows (WL1)' and 'Grassy verges (GS2)'. Only a few drainage ditches correspond to Fossitt (2000) and these are associated with forestry drains and old peatland drains on flatter ground in the northwest of the site. Within and in proximity to these 'Drainage ditches (FW4)' species recorded included eyebright (*Euphrasia officinalis*), water mint (*Mentha aquatica*), coltsfoot (*Tussilago farfara*), brooklime (*Veronica beccabunga*), creeping buttercup (*Ranunculus repens*) and bog pondweed (*Potamogeton polygonifolius*). Scenarios followed in the case that land drainage ditches are encountered are detailed in Chapter 3 Civil Engineering.

Plate 6-15: Drainage ditch on relatively flat ground to the north of turbine T1 at the northwest of the site.

Other Habitats

Some habitats commonly associated with agricultural land recorded within the study area included 'Grassy verges (GS2)', and 'Stone walls and other stonework (BL1)'. These habitats occurred on a scale that was too small to be mapped but are described below.

Grassy verges (GS2). This habitat type primarily occurs along field margins, drainage ditches and existing access tracks that criss-cross the site. During field surveys, species recorded included nettle (*Urtica dioica*), common knapweed (*Centaurea nigra*), thistles (*Cirsium* spp.) docks (*Rumex* spp.), willowherb (*Epilobium angustifolium*), foxglove (*Digitalis purpurea*) and herb-Robert (*Geranium robertianum*). This habitat type does not correspond to any EU Annex I habitats. Minimal areas of this habitat will be removed to facilitate development in the wind farm.

Stone walls and other stonework (BL1). This habitat type was located along old field boundaries becoming dominated by 'Hedgerows (WL1)', within and in proximity to farm holdings, and in association with the derelict cottage and associated farm shed. Species recorded in association with this habitat type were similar to those recorded in association with 'Hedgerows (WL1)' and 'Grassy verges (GS2)' habitats such as foxglove (*Digitalis purpurea*), herb-Robert (*Geranium robertianum*) and nettle (*Urtica dioica*).

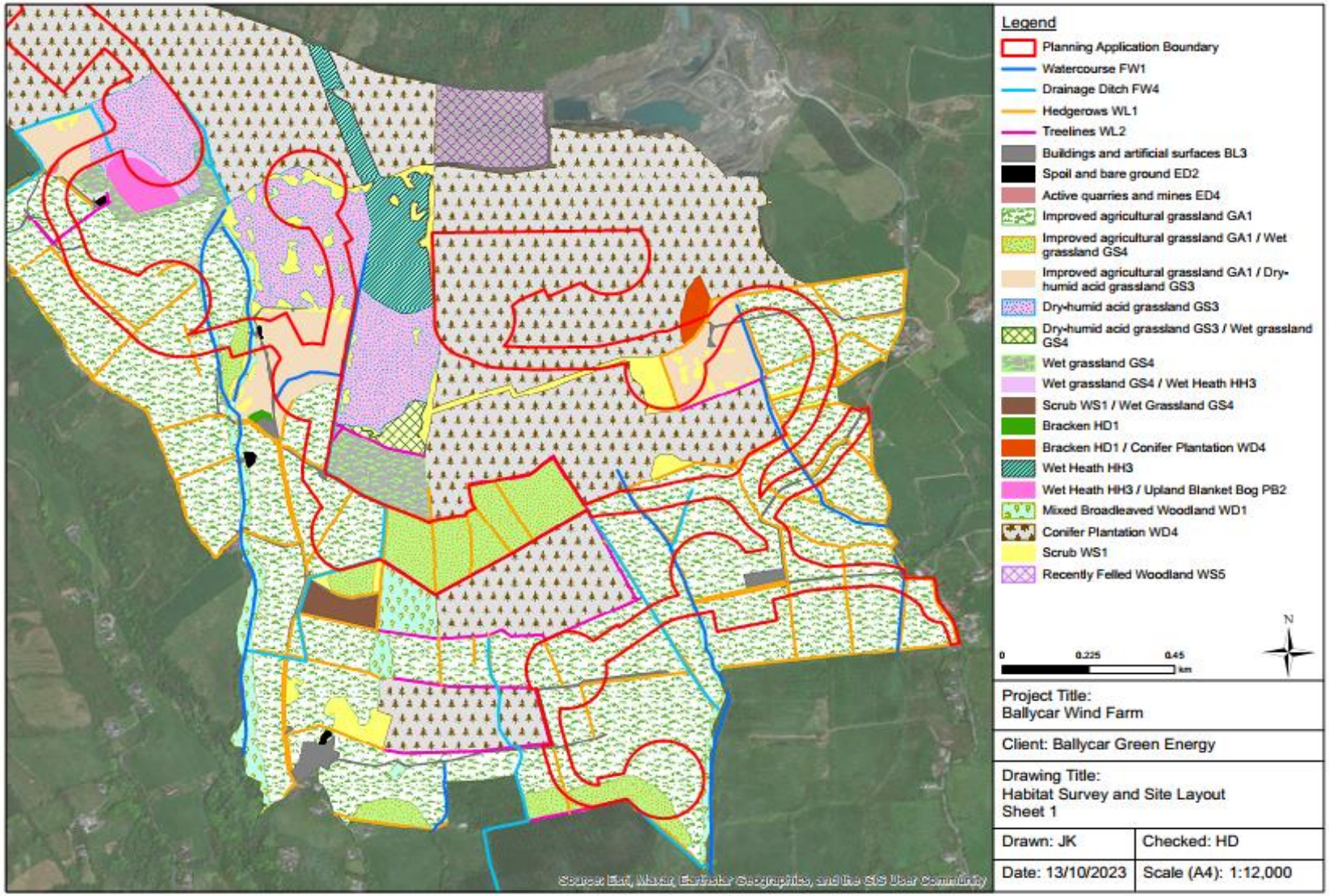

Figure 6-9: Habitats identified within the study area for the Proposed development (Sheet 1 of 2)

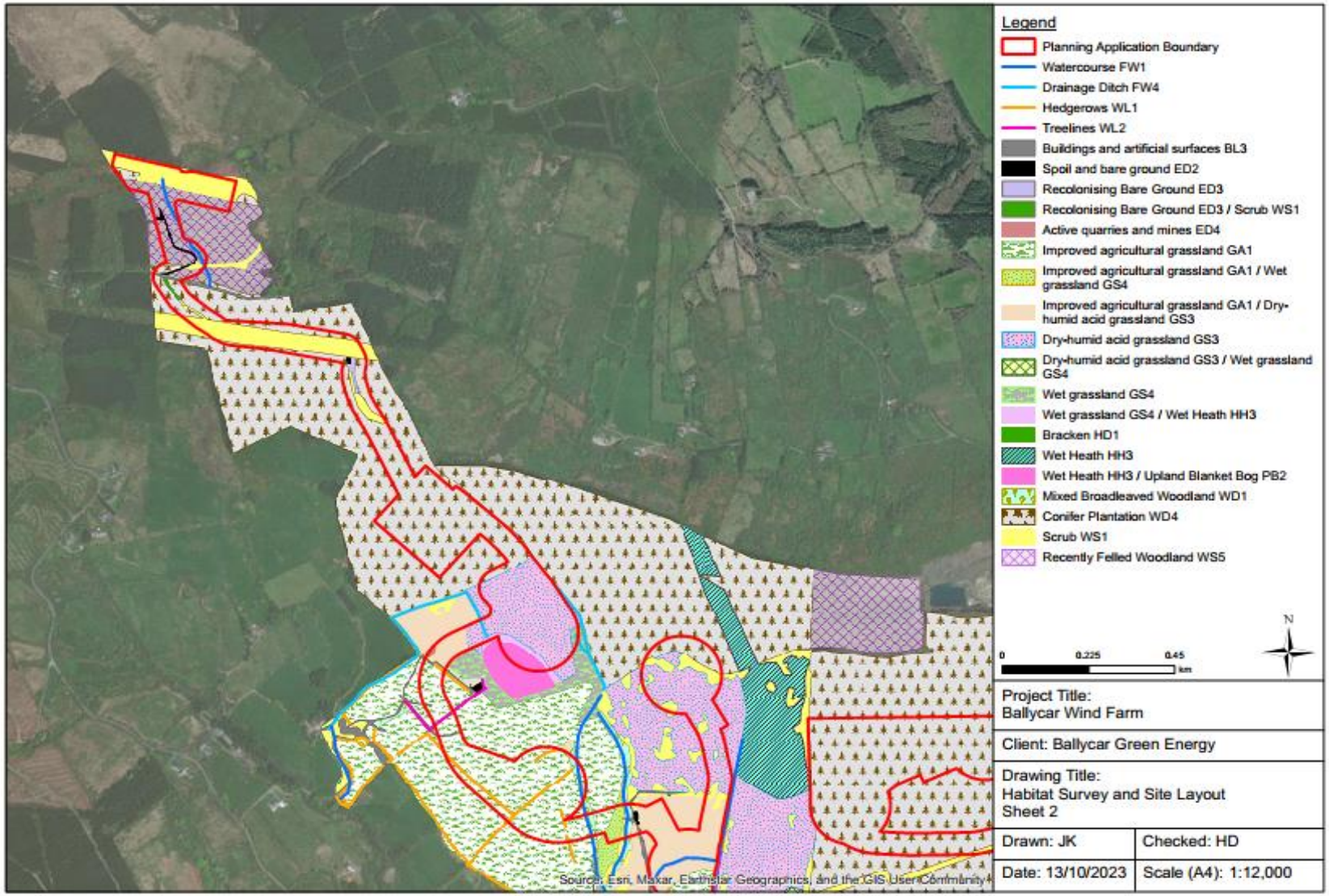

Figure 6-10: Habitats identified within the study area for the Proposed development (Sheet 2 of 2)

6.3.6 Invasive Alien Plant Species (IAPS)

6.3.6.1 Desk Study

A search for invasive plant species recorded in the NBDC database R56 hectad encompassing the study area was carried out on 6th of May 2022, with a focus on non-native plant species listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011).

Documented records of high-impact invasive species listed on the Third Schedule include giant hogweed (*Heracleum mantegazzianum)*, Himalayan balsam (*Impatiens glandulifera)*, and Japanese knotweed (*Fallopia japonica).* Documented records of medium-impact invasive species listed on the Third Schedule include Himalayan knotweed (*Persicaria wallichii)*. Invasive species recorded in the NBDC database that are not listed on the Third Schedule include sycamore (*Acer pseudoplatanus)* and winter heliotrope (*Petasites fragrans)*.

6.3.6.2 Field Surveys

During ecological field surveys of the study area between 2021 and 2023, two invasive plant species listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011) were recorded; Japanese knotweed (*Fallopia japonica*) and Himalayan balsam (*Impatiens glandulifera*). Cherry laurel (*Prunus laurocerasus*) was also recorded. While this species is not listed under the Third Schedule, it is considered to be a High-Impact invasive species.

Japanese knotweed is classified as a high impact species. Surveys determined the distribution of this species to be minimal within the study area, restricted to two locations where the extent of infestation is very limited. Japanese knotweed was recorded growing in the centre of a farm track along the eastern boundary of an improved agricultural grassland field in the western section of the study area. It was noted that the infestation was not established as only three plants were recorded which were no more than 20 cm tall. It is likely that this species was introduced recently to the site in contaminated material used to build the farm track.

A second infestation was recorded within a hedgerow lining a farm track, in close proximity to the farm holding located to the southeast of the study area. The infestation comprised of a single but established *c.* 1.5 m tall plant growing outwards from the hedgerow.

Himalayan balsam is classified as a high impact species. Extensive infestations of this species were recorded within the study area, mainly within the centre and in the southeast section of the study area. The majority of infestations were associated with drainage ditches, and there are likely additional infestations downstream of the study area, which corresponds with water being the primary method of dispersal for this species.

Cherry laurel (*Prunus laurocerasus)* was recorded at six locations within hedgerows forming field boundaries within the study area.

Plate 6-16: Japanese knotweed, not yet established, located adjacent to a farm track

Plate 6-17: Japanese knotweed located in hedgerow adjacent to a farm track

No other invasive plant species were recorded during any of the ecological surveys carried out.

A management plan for invasive species can be found in Appendix 6F.

6.3.7 Rare and Protected Flora

6.3.7.1 Desk Study

The desktop study included a review of data held by the NBDC for the hectad R56 and data on rare and protected species provided by NPWS following an information request. The search targeted plant species listed in Annex II of the EU Habitats Directive, Flora Protection Order species (FPO) (2022), and species listed in The Irish Red Data Book (Wyse Jackson, et al. 2016) within the hectad R56 which encompasses the study area. Species records are listed in Table 6-6 below.

Table 6-6: Documented records of protected flora species within hectad R56

Name	Record Date	Designations and Status	Habitat Requirements (Curtis and McGough, 1988)[27][28]
Wood Club-rush *Scirpus sylvaticus*	1903	Red List: Near Threatened (Wyse Jackson *et al.,* 2016)[29]	Wet grassland areas, adjacent to watercourses and still water.
Small-white Orchid *Pseudorchis albida*	1961	Flora Protection Order (2022)[30] Red List: Vulnerable	Dry grasslands in upland or coastal areas. Very rare.
River Bristle-moss *Orthotrichum rivulare*	1972	Red List: Near Threatened	Riverside rocks and trees, where the river is particularly silty.
Reindeer Moss *Cladonia portentosa*	2003	Annex V of the EU Habitats Directive (92/43/EEC)	Peatland habitats such as heath and blanket bog, amongst areas of low vegetation. Coastal habitats such as dunes.

6.3.7.2 Field Survey

The study area is dominated by conifer plantation and intensively managed agricultural grassland. No rare or protected flora species, including any of those listed in Table 6-6 above, were recorded during any of the ecological surveys undertaken. While the lack of evidence of a protected species does not necessarily preclude its presence at the site either at this current time or in the future, it was noted that watercourses and wetland areas within the study area are not considered suitable for either wood club-rush or river bristle-moss. River bristle-moss requires wet grassland high in silt content[31].

There are pockets of suitable habitat present for both small-white orchid and reindeer moss, particularly in the north and northwest sections of the study area where the lands are less intensively managed. Here, the dry upland grassland area identified in mosaic with wet grassland could potentially provide suitable habitat for small-white orchid while the heath and bog habitats could potentially provide suitable habitat for reindeer moss. However, neither of these species were recorded during any field surveys.

6.3.8 Non-Volant Mammals

6.3.8.1 Desk Study

Records of protected non-volant mammals were retrieved from the NBDC database for the hectad R56 which encompasses the study area and information received from the NPWS data request for rare and protected species were reviewed. These records are listed in Table 6-7 below.

[27] https://www.npws.ie/sites/default/files/publications/pdf/Curtis_1988_PlantsRedBook.pdf
[28] https://www.irishwildflowers.ie/habitats.html
[29] https://www.npws.ie/sites/default/files/publications/pdf/RL10%20VascularPlants.pdf
[30] https://www.irishstatutebook.ie/eli/2022/si/235/made/en/pdf
[31] https://www.britishbryologicalsociety.org.uk/wp-content/uploads/2020/12/Orthotrichum-rivulare-sprucei.pdf

Table 6-7: Records of protected non-volant mammals from hectad R56

Common Name	Species Name	Level of Protection	Record Origin
Badger	*Meles meles*	Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Fallow deer	*Dama dama*	Invasive Species - High Impact. Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Hedgehog	*Erinaceus europaeus*	Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC
Irish hare	*Lepus timidus hibernicus*	Annex V, Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Irish stoat	*Mustela erminea hibernica*	Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Otter	*Lutra lutra*	Annex II & IV, Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Pine martin	*Martes martes*	Annex V, Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Pygmy shrew	*Sorex minutus*	Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC, NPWS data request
Red squirrel	*Sciurus vulgaris*	Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000)	NBDC

American mink and bank vole were also recorded in the hectad and are categorised as High Impact and Medium Impact Invasive Species, respectively.

6.3.8.2 Field Surveys

<u>Badger</u>

No visual observations were made of this species. However, signs of badger activity were frequently recorded throughout the study area not only during the dedicated badger surveys completed in October 2021 but also during other ecology surveys, over 2021 to 2023. Evidence of badger activity in the form of scats, latrines, tracks and hair, was recorded throughout the study area, primarily within and in proximity to field boundaries comprised of hedgerows and treelines. Badger activity was also recorded by trail cameras.

Badger setts, four in total, were recorded within the study area - Sett A (Main Sett), Sett B (Outlier Sett), Sett C (Main Sett), and Sett D (Subsidiary Sett). All four setts showed signs of badger activity and two setts, Sett A and Sett C, had badger activity confirmed by trail cameras. None of the setts are within 30 m or 50 m of a proposed turbine location or access track.

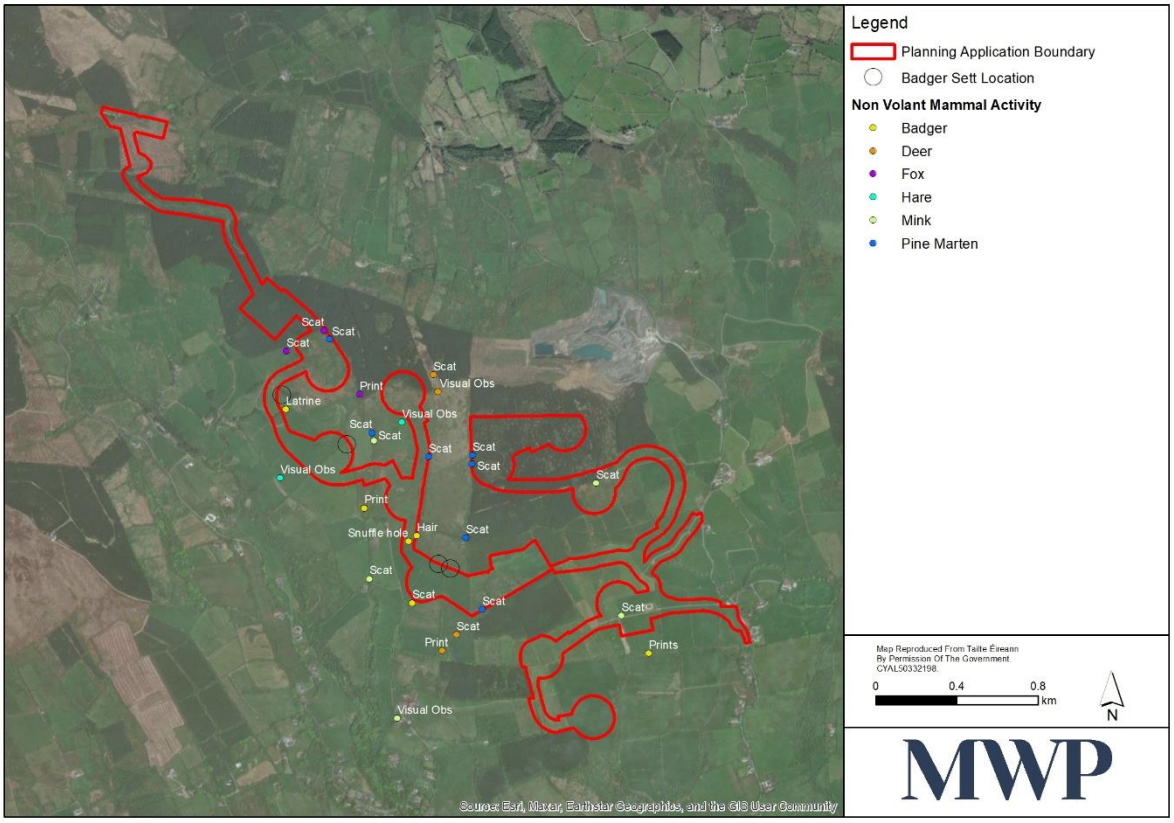

Figure 6-11: Badger setts and other non-volant mammal activity identified within the EIA study area

Otter

No breeding or resting sites for otter were recorded within the study area, nor was any evidence of otter, such as prints or spraints, found. The watercourses within the site are considered sub-optimal for foraging otter as they are too small to support fish in numbers that would make it energetically feasible for foraging otter. It is likely that the larger watercourses further downstream are more suitable for breeding and foraging otter.

Pine Marten

While no direct observations of this species were made during surveys, evidence of pine marten was recorded throughout the study area in the form of scats which were recorded along treelines, hedgerows and in proximity to the conifer plantation to the north and northwest. Pine marten were also recorded on two of the trail cameras deployed within the study area.

Other Mammal Species

Visual observations were made of Irish hare, particularly within the wet grassland and heath habitats present in the north and northwest sections of the study area. An Irish stoat was recorded on a trail camera set up in proximity to a badger sett in the northwest of the study area. No other protected non-volant mammal species were recorded. Habitats within the EIA study area were considered to be suitable for breeding and resting habitats for a range of protected mammal species, with a number of badger setts being recorded on the site but outside of the proposed construction corridor. In consideration of the proximity and scale of the proposed works a number of mitigation measures for badger will be implemented which will also safeguard other protected mammal species.

Other species recorded included fox, rabbit, sika deer and American mink.

The implementation of all mitigation measures will be overseen by a Project Ecologist/Ecological Clerk of Works (ECoW).

Pre-construction surveys will be carried out by a suitably qualified ecologist to determine badger activity and establish current status of previously identified setts and/or any new setts within the survey area. For setts identified, fencing and soil mounds will be erected to provide visual screening of construction activity and associated noise from each sett whilst providing a distance buffer for the duration of the works. Signs will be erected to alert construction workers that the exclusion area must not be breached and working hours will be limited to daylight hours in this area. No works will occur within 50m of any active sett during the breeding season (December – June) nor within 30m of an active sett during the non-breeding season (July – November). A wildlife licence for badger will be required from NPWS with regards to badger setts which have the potential to be directly/indirectly impacted by the proposal.

Further information can be found in the 'Non-volant Mammal Survey Report' for the Proposed development, which can be found in Appendix 6B.

6.3.9 Bats

O'Donnell Environmental Ltd., were commissioned by Ballycar Green Energy Ltd. to undertake a bat survey assessment and report in relation the proposed development. The report comprises a desktop review, daytime visual assessment of potential bat roosting features, passive detector surveys and active transect surveys. Each of which are described in the subsections below.

For more information on the bat surveys undertaken, please refer to the 'Bat Survey Report' for the proposed development which can be found in Appendix 6A.

6.3.9.1 Desk Study

A desktop review of publicly available relevant data was undertaken on the National Biodiversity Data Centre (NBDC) and National Parks and Wildlife Service (NPWS) websites.

The proposed development is not located within any internationally or nationally designated sites. Following NatureScot (2021), a search was undertaken for nationally or internationally designated bat roosting sites. Three Special Areas of Conservation (SAC) and three proposed National Heritage Areas (pNHA) which include bats in their conservation interests are present within 10km of the proposed windfarm site (see Table 6-8 below).

Table 6-8: Designated sites (with bats listed as the conservation interest) within 10km of the proposed development

Site Name	Species	Site Code	Distance (km)
Cloonlara House pNHA	Leisler's Bat	000028	4.9
Danes Hole, Poulnalecka SAC	Lesser Horseshoe Bat	000030	6.8
Danes Hole, Poulnalecka pNHA	Lesser Horseshoe Bat	000030	7
Ratty River Cave SAC	Lesser Horseshoe Bat	002316	7.4
Castleconnell (Domestic Dwelling, Occupied) pNHA	Daubenton's Bat	000433	7.7
Kilkishen House SAC	Lesser Horseshoe Bat	002319	9.8

Cloonlara House pNHA is located 4.9km the proposed development boundary. While the foraging range of Leisler's Bat has been recorded as being up to 13.4km (Shiel et al., 1998), the proposed development is outside the core sustenance zone (CSZ) of the roost, based on best available information for species occurring in Ireland

which range from 1km to 4km(Collins, 2023). In consideration of a search area extending to 4km and the location of the pNHA beyond the extent of this area, it is considered that there is no likelihood for the proposal to have any significant effects on the conservation objectives of Cloonlara House pNHA.

The NBDC holds previous records of bat presence from within the 10km square (R56) in which the proposed site is located. These records are for Brown Long-eared Bat (Plecotus auritus), Common Pipistrelle (Pipistrellus pipistrellus), Soprano Pipistrelle (Pipistrellus pygmaeus), Leisler's Bat (Nyctalus leisleri), Daubenton's Bat (Myotis daubentonii) and the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat (Rhinolophus hipposideros). It is important to note that an absence of other bat species records may be reflective of a lack of surveys undertaken to date rather than absence of bat species.

An indication of the relative importance of the wider landscape of the study site, based on a *Model of Bat Landscapes for Ireland*, was undertaken this has a noted index ranging from 0 to 100, with 0 being least favorable and 100 most favorable (Lundy *et al.*, 2011).

With regard to the area within the proposed wind farm site, the overall Bat Habitat Suitability Index (BHSI) rating for all bat species within the site is 32.78, which suggests the landscape in which the proposed site is located is of moderate suitability for bats in general. Refer to **Table 6-9** for more information and species-specific scoring.

Table 6-9: Bat Habitat Suitability Index (BHSI) for the proposed development site and surrounds according to 'Model of Bat Landscapes for Ireland' (Lundy et al., 2011)

Species		Suitability Index Rating (R56)
		Within PDS
All Bats		32.78
Lesser Horseshoe bat	*Rhinolophus hipposideros*	15
Nathusius' pipistrelle	*Pipistrellus nathusii*	4
Daubenton's bat	*Myotis daubentonii*	36
Natterer's bat	*Myotis nattereri*	37
Whiskered bat	*Myotis mystacinus*	1
Common pipistrelle	*Pipistrellus pipistrellus*	46
Leisler's bat	*Nyctalus leisleri*	45
Soprano pipistrelle	*Pipistrellus pygmaeus*	45
Brown long-eared bat	*Plecotus auritus*	51

Bat Conservation Ireland conducted a search of their records database by request on the 5th May 2023. The data search included a 30km radius from a central point within the proposed site. Known roost locations as well as results from BCI volunteer surveys and records were provided. Where roost locations occur in private dwellings the location provided refers to the bottom left corner of the relevant 1km grid square.

The BCI roost records were considered within a search area extending to 4km from proposed turbine locations, and two roost records were identified. These are located within 1km grid squares which are approx. 2km south-east of the wind farm site at the closest point (see **Figure 6-12**). Species recorded at the roost located further east (R5860) are Brown Long-eared Bat, Myotis spp., and the Annex II listed Lesser Horseshoe Bat. The western-most roost (R5659) is a tree roost of an unidentified bat species and is located 2.7km from Turbine 12.

A protected species data request was submitted to NPWS and species records for the relevant area were received on 1st November 2023. All but three of the NPWS Lesser Horseshoe Bat records coincide with the BCI identified roost locations. NPWS data shows that Lesser Horseshoe Bat has been recorded at Ardnacrusha, Co. Clare, approximately 2.4km south-east of the closest proposed turbine (Turbine 12). Two additional records of the species are located further south-east of the site (see **Figure 6-12**), for which the conservative 4km core sustenance zone (CSZ) does not overlap with the site.

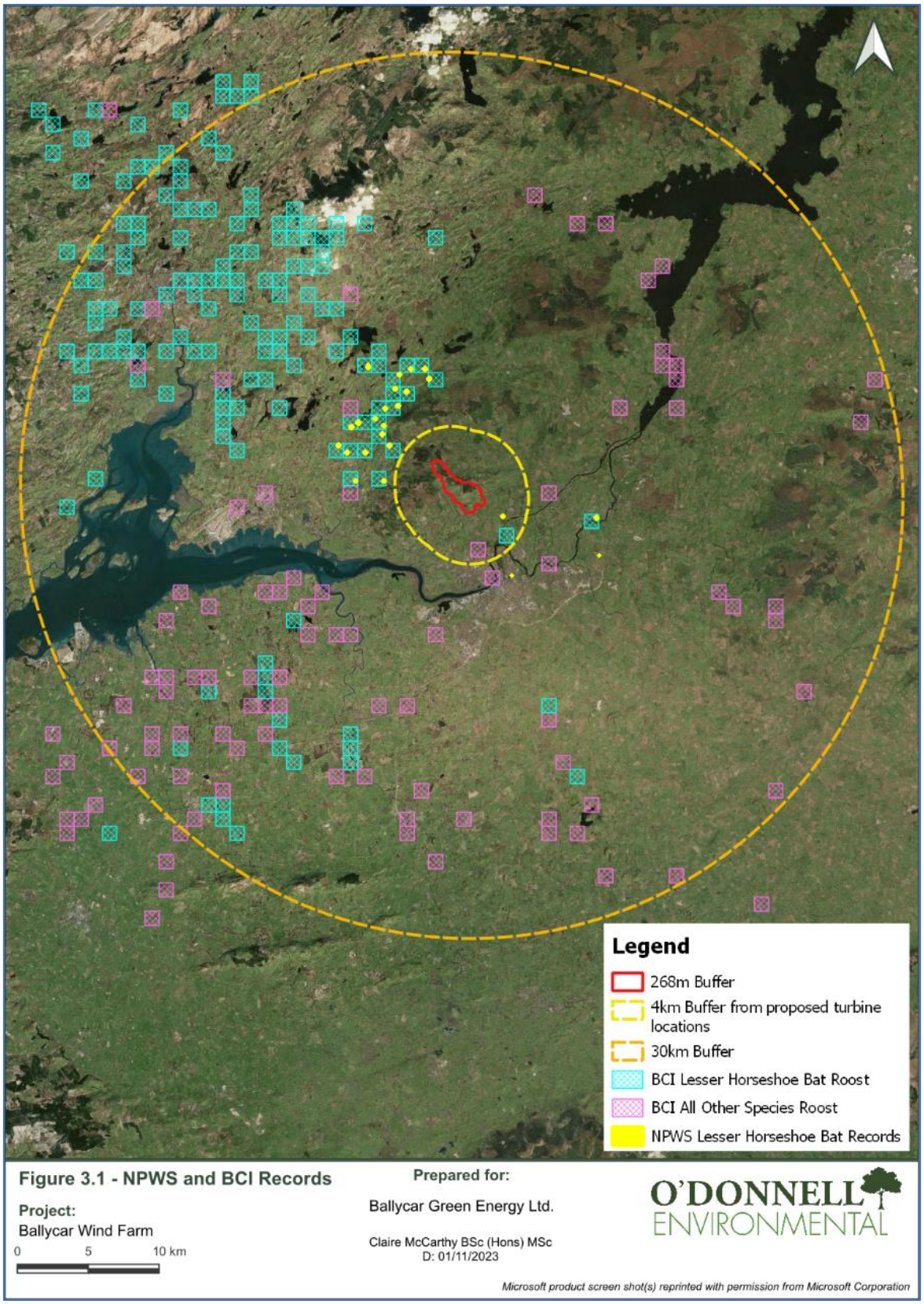

Figure 6-12: Bat roost locations identified via desktop review provided by BCI (taken from Appendix 6A)

6.3.9.2 Field Surveys

Passive Bat Survey

A moderate to high level of activity was recorded at the site, and a high level of species diversity. A total of nine bat species were recorded (possibly ten as Whiskered Bats and Brandt's Bats are indistinguishable through ultrasonic detection). A total of nine bat species were recorded and included Common Pipistrelle, Soprano Pipistrelle, Brown Long-eared, Daubenton's, Leislers, Lesser Horseshoe, Natterers, Whiskered and Myotis sp.

Common Pipistrelle was the most common species with 82.1% of all registrations, while Leisler's Bat accounted for 7.2% of all registrations. This was followed by Soprano Pipistrelle at 4.4%.

The highest level of bat activity was recorded at the monitoring stations at the proposed location for Turbine 6 (Bat_6P) which accounted for 24.1% of all registration recorded across the three survey seasons followed by the Turbine 8 monitoring station, accounting for 16.24% of all registrations recorded (refer to Figure 2.1 **Appendix 6A** for passive detector locations also replicated above in **Figures 6-2** and **6-3**).

The Annex II listed Lesser Horseshoe Bat was recorded during the summer deployment, with a total of 83 registrations, accounting for 0.2% of the total registrations recorded. This species was recorded at seven of the 12 monitoring locations. More than half of the total Lesser Horseshoe registrations (56.6%) were recorded at the Turbine 8 monitoring station 'Bat_08' which was located at an alternative location for the summer survey period (see Figure 2.1, **Appendix 6A**) as safe access to the turbine location was not available at the time of deployment.

A passive detector was placed along the proposed grid route on 24th October 2023 for a total of 14 survey nights in order to characterize bat activity in this area. The deployment location is shown as location Bat_13 in Figure 2.1, **Appendix 6A** and was in commercial forestry adjoining a forestry road track. A low level of activity was observed with an average of 7.8 registrations being recorded overall per night. Of the six species recorded, Common Pipistrelle was recorded most frequently and accounted for 79% of all registrations. Leisler's Bat accounted for 11% of all registrations with Natterer's Bat, Brown long-eared Bat, Soprano Pipistrelle and Daubenton's Bat each accounting for less than 5% of registrations. No patterns of activity were recorded which suggested proximity to a significant roost location.

Accounts of the spring, summer, and autumn 2023 passive monitoring survey seasons are detailed in Sections 3.3.1.1, 3.3.1.2, and 3.2.1.3 respectively in **Appendix 6A**. The level of activity recorded at the wind farm site varied according to season, location and species.

Active Transect Survey

Three active bat surveys were carried out at the proposed site for approximately 1.5 hours from dusk on 6th June, 21st August, and 5th September 2023 during which a moderate level of species diversity was recorded. The recorded species included Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Brown Long-eared Bat and Myotis sp.

On the night of the 6th June 2023 activity was low to moderate with a total of 19 registrations all attributed to Common Pipistrelle. Transects A and B were surveyed that night.

On the night of the 21st August 2023 activity was moderate and a total of 103 bat registrations were recorded. Of these, Common Pipistrelle was most commonly recorded and accounted for 71 registrations, Soprano Pipistrelle accounted for 15 registrations, Leisler's accounted for 13 registrations and three Brown Long-eared Bat registrations were recorded. A single registration of Myotis sp. was recorded along Transect C which could not be conclusively identified to species level.

On the night of the 5th September 2023 activity was moderate and a total of 84 bat registrations were recorded. Of these, Common Pipistrelle was the most abundant accounted for 68 registrations, Soprano Pipistrelle

accounted for 15 registrations and a single Leisler's Bat registration was recorded along Transect C. No activity was recorded along Transect A this survey night. Transect D was an additional transect route only surveyed on this survey night. Overall, data derived from active surveys broadly reflected the data derived from passive bat surveys in terms of species diversity and relative abundance. No activity indicative of emergence from (or proximity to) an active roosting location was recorded. While individual observations were made of bats in flight, there were no patterns of behaviour noted which would suggest the presence of important or significant commuting routes. Habitat in the area of Transect C, which recorded relatively high level of activity, was a boundary habitat between forestry and wet grassland. Deforestation occurred in this area following the summer season surveys. Maps of transects surveyed are shown in Figures 3.5 – 3.8 in Appendix 6A.

6.3.9.3 Potential Roost Assessment

Targeted surveys were carried out to determine the presence of bats or Potential Roosting Features (PRFs) where proposed works may effect directly or indirectly on a PRF. The potential suitability of structures for roosting bats present at the proposed development site was classified according to the guidelines in Collins (2023) (refer to Table 2.1 of the Bat Report, Appendix 6A).

In relation to trees, Collins (2023) has moved away from the subjective approach used in Collins (2016) for categorising individual PRFs in trees. Collins (2023) acknowledges the subjectivity of the previous approach and the many constraints associated with surveying trees for bats. The preliminary ecological appraisal (now termed the Daytime Bat Walkover (DBW)) of trees present on site follows the categorisations scheme outlined in Table 2.2 of the Bat Report and replicated below within Table 6-10.

Table 6-10: Scheme for describing the potential suitability of PRFs in trees on a proposed development site for bats.

Suitability	Description
None	Either no PRFs in the tree or highly unlikely to be any.
FAR	Further Assessment Required to establish if PRFs are present in the tree.
PRF	A tree with at least one PRF present.

Following the confirmation of the possible presence of PRFs in trees, the assessment of suitability is further refined during a Ground Level Tree Assessment (GLTA), whereby the potential suitability of such PRFs is categorised according to the system detailed in Table 6-11 below.

Table 6-11: Scheme for describing the potential suitability of PRFs in trees for bats.

Suitability	Description
PRF-I	PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.
PRF-M	PRF is suitable for multiple bats and may therefore be used by a maternity colony.

Three man-made structures considered of relevance to this assessment of the proposed development (i.e. within or proximal to the 'redline' boundary) were surveyed for potential bat roosting. These structures consist of an incomplete blockwork structure (see Plate 18 below), a modern steel agricultural shed displaying 'negligible' suitability for roosting bats, and a derelict stonework cottage displaying 'low' suitability for roosting bats (see Plate 19 below as extracted from Appendix 6A). None of the structures were considered suitable to support a significant bat roost. These structures are not proposed to be removed as part of the current project.

Plate 18: Stone structure present within the proposed wind farm site displaying 'negligible' suitability for roosting bats

Plate 19: Derelict structure present east of proposed Turbine 7 displaying 'low' suitability for roosting bats

A total of 94 trees were identified and assessed within the proposed wind farm site and along the TDR on approach to the proposed site. Trees assessed within the wind farm site consisted primarily of semi-mature and mature Ash and Beech trees located within the mature hedgerow field boundaries of agricultural grassland. Of the trees assessed, 3 displayed PRF-M suitability for roosting bats, and 31 displayed PRF-I suitability.

The remaining 60 trees did not display any suitability for roosting bats, comprised mostly of juvenile individuals or stunted trees showing considerable disease.

During the Ground Level Tree Assessment (GLTA) a single tree considered of moderate suitability (PRF-M) was recorded at the proposed wind farm (Plate 20 below). This tree is not proposed for removal.

14 trees considered to be PRF-I are proposed for removal to facilitate the site layout. Such trees have low suitability for bats and could only be used by an individual or small number of bats.

Following Collins (2023), no further survey of PRF-I trees is warranted.

Plate 20: View of veteran beech displaying 'PRF-M' suitability for roosting bats with fluting at the base and water collecting in welded stems. This tree will not require removal.

The existing habitat that will be traversed by the grid connection route is entirely commercial forestry, with no broadleaved trees of roosting value for bats. Following Marnell et al. (2022) coniferous plantation with no specimen trees have decreased probability of being used by roosting bats and such trees do not require individual assessment for roosting potential. The proposed grid route and location for the associated substation was assessed as were the proposed 'loop-in loop-out' locations (see Appendix A9 and A10 of the Bat Report Appendix 6A). General observations were made regarding bat roost potential on the proposed grid route and substation footprint, and no likelihood of suitability for roosting was noted.

Although not included in the redline boundary, the turbine delivery route and the potential impact of associated facilitation works was considered and assessed. Works along the TDR as it approaches the site boundary include widening of existing gateway, temporary widening of public roads and works to existing treelines and hedgerows to facilitate 'over-sail' of turbine blades during transport to site.

The relevant Nodes where facilitation works might directly impact upon PRFs for bats were surveyed in detail. Along a section of the Sweeps Road, referred to as 'Node 11' (see Figure 3.4, Appendix 6A), a regularly maintained treeline of Hawthorn, Oak, and Willow exists below the overhead powerlines, which is considered to be of negligible suitability for potential roosting bats. Two mature Beech trees are present where 'over-sail', is anticipated, with PRFs visible from ground level. These trees were surveyed from ground level and are assessed as PRF-M (see Plates 3.5 and 3.6 of Appendix 6A).

6.3.10 Freshwater Aquatic Surveys

6.3.10.1 Desk Study

A desktop review was carried out to collate information on aquatic species and to identify features of aquatic ecological importance within the study area.

Records of protected aquatic species in the environs of the Proposed development were identified (see Table 6-12 below). This information was obtained by accessing the websites of the NPWS[32] and Inland Fisheries Ireland (IFI)[33]. The on-line database of the NBDC[34] was reviewed with regard to records of protected species from within the study area. No protected macroinvertebrate species such as freshwater pearl mussel (*Margaritifera margaritifera*) or white-clawed crayfish (*Austropotamobius pallipes*) were recorded within the R56 hectad.

Table 6-12: Distribution and range of aquatic Annex II listed habitats and species in the R56 hectad containing the Proposed development site

	Code	Current distribution	Current range	Likely reason for distribution in the 10km grid square R56
Floating river vegetation	3260	Yes	Yes	The extent of this habitat has not been mapped and the area is based on the distribution of rivers. There are no particularly important watercourses draining the proposed development site with respect to 3260

[32] https://www.npws.ie/maps-and-data
[33] https://www.fisheriesireland.ie/
[34] http://www.biodiversityireland.ie/

	Code	Current distribution	Current range	Likely reason for distribution in the 10km grid square R56
Sea lamprey	1095	No	No	n/a
River lamprey	1099	Yes	Yes	Part of the River Shannon, which supports this species occurs within R56
Brook lamprey	1096	No	Yes	n/a
Atlantic salmon	1106	Yes	Yes	Part of the River Shannon, which supports this species occurs within R56
White-clawed crayfish	1092	No	Yes	Part of the River Shannon, which supports this species occurs within R56

NBDC records indicate the presence of numerous groups of aquatic insects in this area. Water beetles (Coeloptera) previously recorded include *Agabus* (*Gaurodytes*) *bipustulatus*, *Ilybius fuliginosus*, *Elmis aenea*, *Dytiscidae*, *Hydrobius fuscipes*, *Stictotarsus duodecimpustulatus* and *Hydroporus* spp. Aquatic molluscan records in the study area were minimal with just one species recorded: *Ancylus fluviatilis*. Dragonflies known to occur comprise *Aeshna grandis* and *Pyrrhosoma nymphula*. The habitats of these Odonates are slow flowing waterbodies and lakes. Mayflies known to occur comprise *Baetis rhodani* and *Serratella ignita*.

6.3.10.2 Field Surveys

Aquatic Habitats

The watercourses within the boundary of the proposed development site and indeed the upper reaches of all watercourses draining the proposed development site are high gradient streams considered prone to drying out during prolonged dry spells, based on the water levels observed in June 2021 and June 2023. These reaches are generally fast flowing and of a spate nature i.e. they are rainwater fed from overland flow and thus exhibit fast repsonse to rainfall whilst the upper reaches are considered to have limited lotic carrying capacity due to susceptibility to drying out. They are categorised as eroding/upland rivers with reference to Fossitt (2000). The only aquatic vegetation recorded at the aquatic survey sites were (collectively) the bryophytes *Leptodictyum riparium, Conocephalum* sp., *Chiloscyphus polyanthos* and filamentous algae. At lower elevations, the streams have lower gradients with generally finer particle sizes and smoother flows. Excessive siltation was observed at several survey sites, likely occurring as a result of land management practices associated with agriculture and land management practices.

Aquatic Macroinvertebrates

Benthic Macroinvertebrates

With regard to habitat for benthic macroinvertebrates, the streams draining the proposed development site were rated marginal-suboptimal. The macroinvertebrates recorded are common and most were pollution tolerant with a smaller proportion of pollution-sensitive species. Macroinvertebrates communities across the study area showed reduced diversity. This is considered to be associated with the fluvial condition/habitat suitability of the subject streams, some which are physically degraded due to anthropogenic activities (agriculture, stream crossings). Denuded areas due to agricultural practices are the key issues in this regard.

Biological water quality varied between Q3-4 to Q4-5 in 2021, with only the upper reach of the North Ballycannan Stream being moderately impacted, where other streams in the Crompaun and North Ballycannan subbasins

ranged from Good-High status. Between 2021 and 2023, biological water quality declined at three locations which his attributed in part to substrate siltation, whilst there was an improvement in biological water quality at one site (site 6) on the North Ballycannan Stream. It was noted that water levels in 2023 were higher in 2023 than 2021, with the North Ballycannan Stream experiencing critically low flow in 2021. A drop in flow to such low levels may reduce habitats for aquatic macroinvertebrates in both extent and quality and may account for a change in status in the North Ballycannan Stream between 2021 and 2023. It is evident that streams are sensitive to changes in flow and nutrient loading particularly given those that are small in size and with low assimilative capacity.

Freshwater Pearl Mussel

The proposed development is not located in a freshwater pearl mussel catchment / *Margaritifera* sensitive area in mapping produced by NPWS. Regarding the ecological quality objectives for FPM habitat, the watercourses within and adjacent to the proposed development site generally fail on criteria for macroinvertebrates, macroalgae and siltation (DoEHLG, 2009). The lower reaches of watercourses in the Crompaun and Ballycannan subbasins have been drained/modified where they occur on the floodplain, a pressure on FPM as noted in Moorkens (1999), while the middle to upper reaches of channels in these catchments are considered to have insufficient base flows to sustain FPM.

Drainage from the proposed development site is to the Crompaun, North Ballycannan, and the Blackwater (Clare) Rivers, none of which have previous FPM records. The only watercourses considered sufficiently large to support FPM was the North Ballycannan River and the Blackwater River. During the 2018 survey of the Blackwater River, no FPM were recorded along the survey reach. FPM were not detected during the surveys carried out on the North Ballycannan River in 2021. No live FPM or evidence of FPM in the form of shells were recorded during the field investigations. In general, the sedimentation levels recorded were generally indicative of artificially induced siltation and these conditions are considered unfavourable in terms of the species' habitat. The stretches examined were deemed representative of this river and a variety of microhabitats were surveyed (e.g., clean substrates in riffle, glide and pool under partial and full shade).

The modified character of the lower reach of the North Ballycannan River, being drained, almost certainly precludes FPM presence. Water quality is another factor that negatively influences FPM habitat. The likelihood of FPM occurring in the North Ballycannan River is deemed very low considering the habitats present. The presence of FPM in the Zone of Influence (ZOI) of the proposed development is considered highly unlikely, based on the reasons outlined above.

Water Quality

Q-ratings and the corresponding WFD status derived from the diversity and relative abundance of the macroinvertebrates at the 11 sites surveyed (site 12 was unsuitable for assigning a Q-rating or any other biotic index due to its small size, marginal habitat and difficult access) ranged from 'Q3' to 'Q4-5' with WFD status ranging from 'Moderate' to 'High'. Biological water quality was generally satisfactory in the upper reaches of streams draining the proposed development area, however some local water quality issues associated with agriculture were found to be impacting water quality. Runoff from bare soils next to one stream draining the site was causing substrate siltation which in turn led to reduced biological diversity and reduced biological water quality.

Fish

Salmonid spawning and nursery areas are of variable quality across the sites surveyed. There are no suitable fish habitats within the proposed development site as all waterbodies are considered too small. The streams draining the site increase in value for salmonids with distance from source, due to their greater fluvial area and presence of larger pools with associated increasing size. Indeed, salmonid juveniles and smolts have similar general requirements to those of sexually mature fish, and as they grow, the juveniles of both species of *Salmo* tend to

move into deeper water (Crisp, 2000). This was exemplified by the current results where more cohorts of trout were detected where streams were larger downstream from the Proposed development site.

The downstream reaches of the watercourses draining the proposed development site collectively support brown trout, European eel and brook lamprey. It is concluded that salmon and migratory lampreys (sea and river lamprey) are highly unlikely to occur in the watercourses potentially affected by the proposed development, and that salmon are not present in the Crompaun or North Ballycannan catchments due to stream size, poor habitat in the lower reaches and the impediment of fish passage. Habitat for juvenile lampreys is unsuitable along high gradient reaches close to the proposed development site but improves in their lower reaches where gradient is low. There appears to be no fish populations in the South Ballycar or West Roo Streams that drain the eastern extent of the proposed development. This is most likely due to steep artificial inclines where these streams meet the River Shannon. Salmon, minnow, stickleback and stone loach occur in the Blackwater catchment north of the proposed development site.

Water quality problems associated largely with siltation reduce the salmonid habitat value in the North Ballycannan catchment and the lower reaches of the Crompaun catchment. As pointed out by Crisp (2000), inert suspended solids can have a variety of effects upon salmonid fishes. They may have indirect effects through reduction of light input and, when they settle out in slower flows, they may occlude gravel interstices and reduce the number of hiding places for small fish and/or their invertebrate prey. More directly, they may abrade or clog delicate membranes (e.g., fish gills) and they may cause skin irritation and abrasions, which may facilitate various secondary infections (Crisp, 2000).

Common Frog

Adult frog was recorded during electrical fishing in watercourses at Site 7 and Site 10 during June 2021. The species was not recorded during sampling efforts in June 2023. These sites are located approximately 1km south and 2km east of the proposed development. Both sites are located downstream of the proposed development. Frogs will sometimes use streams during summer-time when flows are low. Frogs can be expected to occur in the streams within the proposed development site also.

Further results pertaining to common frog are outlined in Section 6.3.11 below.

For more information on the results of the freshwater aquatic field surveys, please refer to the 'Aquatic Survey Report' for the proposed development which can be found in Appendix 6C and the following section.

6.3.11 Reptiles & Amphibians

Common frog (*Rana temporaria*), smooth newt (*Lissotriton vulgaris*) and common lizard (*Zootoca vivipara*) have been recorded previously in the hectad R56 encompassing the study area. All three species are protected under the Wildlife Acts, 1976 to 2021, as amended (and Wildlife (Amendment) Act, 2000) and common frog is also listed under Annex V of the EU Habitats Directive.

The study area has habitats suitable for all life stages of frog. The wet grassland habitats are considered important for froglets and adult feeding. Some wetter parts of the site are suitable spawning areas and likely used by hibernating frogs, but such habitats are sparse. Two such areas were identified during the February 2022 survey in the northwest section of the study area, in the form of drains adjacent to the wet heath/cutover bog habitat. One of these areas is located within the redline boundary in the vicinity of T1 whilst the second area is located just southeast of the boundary of T1. Several adult frog carcasses were recorded near these spawning sites during the survey. The species was not noted during 2023 walkover of the site. Please refer to Appendix 6C which includes mapping and additional information relating to common frog results.

While smooth newt and common lizard were not recorded during ecological surveys of the study area, there is suitable resting and breeding habitat for these species present. Rocky outcrops which occur throughout the northwest and northeast section of the study area are likely to be used by basking common lizard, a small proportion of these is overlapped by the proposed infrastructure. In spite of this overlap, considering the presence of habitat in the broader landscape wherein common lizard may occur and considering no common lizards were recorded during ecological surveys of this area, the outcropping is not considered to be of particular ecological value to the species and its removal is deemed negligible.

6.3.12 Terrestrial Macro-Invertebrates

6.3.12.1 Desk Study

NBDC records from the hectad R56 overlapping the study area indicate documented records for butterflies, and moths (*Lepidoptera*), beetles (*Coleoptera*) and bees (*Hymenoptera*). Species of note, including the legislative protection and/or conservation status of these species, are listed in Table 6-13 below.

Table 6-13: Documented records of terrestrial macro-invertebrates within hectad R56 encompassing the study area.

Common Name	Species Name	Level of Protection/Conservation Status[35]
Dingy Skipper	*Erynnis tages*	None/'Near Threatened'
Marsh Fritillary	*Euphydryas aurinia*	Annex II/'Vulnerable'
Small Heath	*Coenonympha pamphilus*	None/'Near Threatened'
Wall butterfly	*Lasiommata megera*	None/'Endangered'
Barbut's Cuckoo Bee	*Bombus (Psithyrus) barbutellus*	None/'Endangered'
Large Red-Tailed Bumble Bee	*Bombus (Melanobombus) lapidarius*	None/'Near Threatened'

Of note are records of marsh fritillary butterfly. This species is the only Irish butterfly species listed under Annex II of the EU Habitats Directive and in the latest Red List assessment of Irish butterflies (Regan *et al.,* 2010) the species was assessed as 'Vulnerable'. The overall assessment of the conservation status of this species is currently 'Inadequate' but 'Improving' (NPWS, 2019).

6.3.12.2 Field Surveys

Marsh Fritillary

Habitat Condition Assessment surveys (HCAs) were conducted in July and August 2021 to determine whether suitable habitat for the species was available within the study area. Based on the positive results of the habitat condition assessment surveys, follow-up larval web surveys were carried out in September 2021.

[35] https://www.npws.ie/sites/default/files/publications/pdf/RL_2010_Butterflies.pdf; https://www.npws.ie/sites/default/files/publications/pdf/Fitzpatrick_et_al_2006_Bee_Red_List.pdf

The Habitat Condition Survey (HCA) covered 49.7ha within the survey area. It was determined that two of the five survey areas, Field B and Field C, contained suitable habitat for marsh fritillary, being identified as 'Good Condition Habitat'. Suitable habitat for marsh fritillary accounted for 18.5ha or 37.2% of the total HCA survey area, comprising 14.5ha in Field B and 4.0ha in Field C. The remaining survey areas (comprising approximately 31.2ha) were determined to be 'Unsuitable Habitat' for marsh fritillary.

Larval webs surveys were undertaken in Field B and Field C on 3rd and 6th of September 2021 (See **Figure 6-13**). Six occupied larval webs and thirteen unoccupied larval webs were recorded in Field B. No larval webs were recorded in Field C. Using the guidance set out in the NBDC's Marsh Fritillary Web Survey information sheets, it was determined that Field B had an estimated population size of 11 webs/hectare.

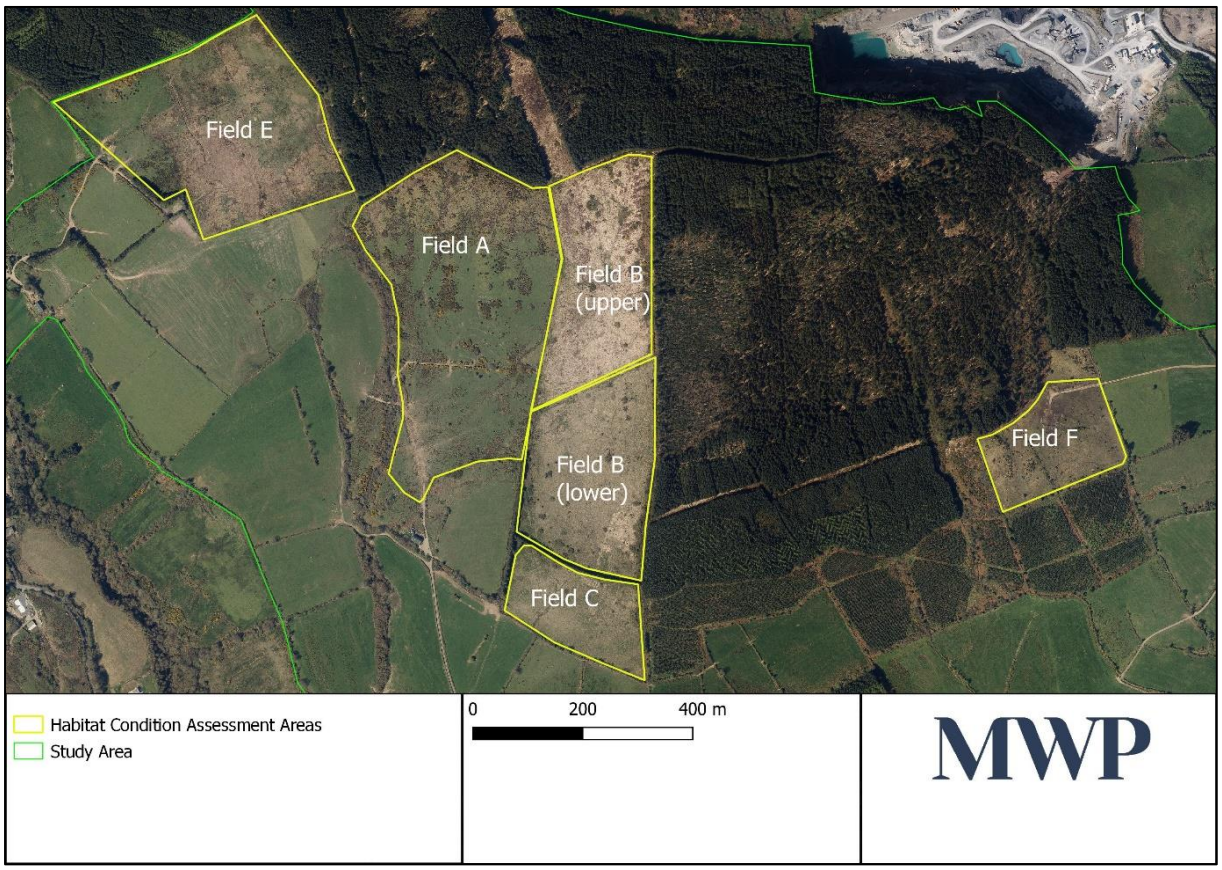

Figure 6-13: Map of the marsh fritillary habitat condition assessment survey areas within the study area

As both Field B and Field C are outside the proposed works area, it is considered that no 'Good Condition Habitat' for marsh fritillary will be lost as a result of the proposed wind farm's development.

For more information on the results of the marsh fritillary field surveys, please refer to the 'Marsh Fritillary Report' for the proposed development which can be found in **Appendix 6D.**

Other Terrestrial Invertebrates

None of the other protected and/or threatened species listed in **Table 6-13** above were recorded during ecological surveys completed in the study area. A number of other species of butterfly and bee were noted during surveys, including the small tortoiseshell butterfly, the peacock butterfly, speckled wood, meadow brown, ringlet, silver-washed fritillary, orange tip, painted lady, small heath, green-veined white, common carder bee, and white tailed bee species. None of these species are considered threatened or vulnerable and are not afforded legal protection in Ireland.

6.3.13 Identification of Important Ecological Features (IEFs)

6.3.13.1 Designated Sites

Sites of International Importance

With regard to Natura 2000 sites, a Screening for Appropriate Assessment was prepared to determine whether the proposed development, alone or in-combination with other plans or projects, could have significant effects on the Natura 2000 sites listed in Table 6-3, Section 6.3.4.1 above, in view of the conservation objectives of these sites.

The Screening for Appropriate Assessment report could not objectively conclude that the proposed development would not result in likely significant effects on two of these Natura 2000 Sites, namely the River Shannon and River Fergus Estuaries SPA (004077) and the Lower River Shannon SAC (002165), without the implementation of appropriate mitigation measures, therefore a Natura Impact Statement (NIS) was undertaken in relation to these European sites.

The NIS prepared in relation to the proposed development determined that, in the absence of effective water quality protection measures, there is a risk of potential localised, temporary reduction in water quality associated with the construction phase of the works, and therefore mitigation is required, with particular regard to downstream European sites including the Lower River Shannon SAC and the River Shannon and River Fergus Estuary SPA. No significant effects to water quality are foreseen during the operational phase; however, potential effects to water quality were identified during the construction phase requiring mitigation, as these sites are downstream receptors with regard to waterbodies draining the site. In the absence of appropriate mitigation measures, adverse water quality effects cannot be ruled out at this stage. Decommissioning phase effects are considered to be similar to construction phase effects though of considerably less scale since excavations will not be required. Consequently, mitigation measures for decommissioning phase will be similar to those of the construction phase, but of a significantly lesser scale.

The NIS concluded that, with the appropriate mitigation measures implemented, the proposed development, alone or in combination with other plans or projects, will not result in adverse effects on the integrity of any European sites, namely the River Shannon and River Fergus SPA (004077) or the Lower River Shannon SAC (002165), in view of their Conservation Objectives.

Therefore, European sites will not be considered further in this evaluation. Please refer to the Screening for Appropriate Assessment and NIS reports which have been submitted with the planning application.

Sites of National Importance

Due to the fact that several of the nationally designated sites identified to be within the ZOI of the proposed development, namely Knockalisheen Marsh pNHA, Fergus Estuary and Inner Shannon, North Shore pNHA, Glenomra Wood pNHA, Inner Shannon Estuary, South Shore pNHA and Dane's Hole, Poulnalecka pNHA, spatially overlap with some of the Natura 2000 Sites outlined above, it is considered that any potential effects to these pNHAs arising from the proposed development are fully considered as part of the assessment of effects on Natura 2000 Sites in the AA Screening and NIS reports.

Implementation of the mitigation measures outlined in the NIS accompanying the planning application will also serve to protect the nationally designated sites with which the River Shannon and River Fergus Estuaries SPA and Lower River Shannon SAC overlap. The above outlined pNHAs will therefore not be considered further in this evaluation.

With regard to the remaining nationally designated sites identified to be within the ZOI of the Proposed development, namely Woodcock Hill Bog NHA, Gortacullin Bog NHA, Doon Lough NHA, Cloonloum More Bog NHA,

Garrannon Wood pNHA, Castle Lake pNHA, Castleconnell (Domestic dwelling, occupied) pNHA, Loughmore Common Turlough pNHA, Rosroe Lough pNHA, Lough Cullaunyheeda pNHA, Fin Lough (Clare) pNHA, Dromore & Bleach Loughs pNHA and Ballycar Lough pNHA, it is considered that due to an absence of ecological/hydrological connection and thus impact pathways, any effects on these sites as a result of the proposal are not envisaged and therefore, these sites will not be considered further in this evaluation.

It is considered that Cloonlara House pNHA is located within the ZOI of the proposed development. There is potential for impacts on the bat population for which Cloonlara House pNHA is designated (one of the biggest nursery sites in Ireland and Europe for Leislers Bat (*Nyctalus leisleri*)). This site, which is 4.9km from the proposed development, is therefore selected as an IEF and brought forward for consideration in this evaluation.

Additional Sites

The Shannon and Fergus Estuaries important bird area (IBA code IE068) overlaps with both the River Shannon and River Fergus Estuaries SPA (004077) and the Lower River Shannon SAC (002165). The NIS concluded no adverse effects on the integrity of these Natura 2000 sites with the implementation of mitigation measures (see **Section 6.3.13.1** above). Due to overlap between the IBA and the SAC and SPA, implementation of the mitigation measures outlined in the NIS will also serve to protect the Shannon and Fergus Estuaries IBA. This site will therefore not be considered further in this evaluation.

6.3.13.2 Selection of Key Habitats as Important Ecological Features

The habitat types within the proposed development site are evaluated in **Table 6-14** below for their conservation importance. Those identified as being of 'Local importance (higher value)' are selected as Important Ecological Features (IEFs).

Table 6-14: Selection of habitats within the development area as IEFs

Ecological receptor	Extent/Location	Ecological value in Context of Study Area	Rationale	Important Ecological Feature
Spoil and Bare Ground (ED2)	Small pockets within study area	Local importance (lower value)	No intrinsic ecological value	No
Active Quarries and Mines (ED4)	Small borrow pit in northwest of the study area	Local importance (lower value)	No intrinsic ecological value	No
Buildings and Artificial Surfaces (BL3)	Comprising existing dwellings, farm buildings and tracks, etc. Buildings located primarily at the periphery of the study area.	Local importance (higher value)	Predominantly of low ecological value, although Locally important habitat for bat species at some locations in the study area (Moderate-Low value bat-roosting habitat)	**Yes**
Improved Agricultural Grassland (GA1)	One of two dominant habitats; primarily in the south, west and east of the study area	Local importance (lower value)	No significant intrinsic ecological value	No

Ecological receptor	Extent/Location	Ecological value in Context of Study Area	Rationale	Important Ecological Feature
Improved Agricultural Grassland (GA1)/Dry-humid acid Grassland (GS3)	In some upland areas of the study area, signs of long-term cattle activity with extensive trampling	Local importance (lower value)	Habitat degraded due to cattle activity, no intrinsic value	No
Improved Agricultural Grassland (GA1)/Wet Grassland (GS4)	GA1 transitions to GS4 in relatively wet and/or waterlogged areas, signs of long-term cattle activity	Local importance (lower value)	Habitat degraded due to cattle activity, no intrinsic value	No
Dry-humid acid Grassland (GS3)	In relatively upland areas of the study area	Local importance (higher value)	Semi-natural grassland habitat. Relatively species-rich areas. Overlaps with development site.	**Yes**
Wet Grassland (GS4)	Occurs mainly in the western half of the study area, but outside the footprint of the works. Often occurs in mosaic with other grassland habitats	Local importance (lower value)	Relatively species-rich areas will not be impacted by proposed development.	No
Dry-humid acid Grassland (GS3)/ Wet Grassland (GS4)	Occurs in more upland sections of the study area where the ground is more waterlogged	Local importance (lower value)	Semi-natural grassland habitat. Waterlogged areas are relatively species poor and are of no intrinsic value	No
Wet Grassland (GS4)/Wet Heath (HH3)	Minor area in northwest of the study area	Local importance (higher value)	Species rich area.	**Yes**
Wet Grassland (GS4)/ Scrub (WS1)	Occurs throughout the study area in mosaic	Local importance (higher value)	Locally important habitat, provides cover and potential foraging and breeding habitat for a variety of species	**Yes**
Grassy Verges (GS2)	Along field margins, edges of some existing farm tracks	Local importance (lower value)	No significant intrinsic ecological value	No
Conifer Plantation (WD4)	One of two dominant habitats; found throughout study area, mostly in north and central areas	Local importance (lower value)	No significant intrinsic ecological value	No
Dense Bracken (HD1)	Relatively minor area in west of the study area	Local importance (lower value)	No significant intrinsic ecological value	No
Dense Bracken (HD1)/Conifer Plantation (WD4)	Isolated pocket in the northeast of the study area	Local importance (lower value)	No significant intrinsic ecological value	No
Scrub (WS1)	Pockets of habitat throughout, often edging conifer plantations.	Local importance	Locally important habitat, provides cover and potential	**Yes**

Ecological receptor	Extent/Location	Ecological value in Context of Study Area	Rationale	Important Ecological Feature
	Typically scattered and patchy distribution	(higher value)	foraging and breeding habitat for a variety of species	
Hedgerows (WL1)/ Treelines (WL2)	Throughout area, delineating field boundaries and bordering tracks	Local importance (higher value)	Potentially important foraging, commuting, breeding, and resting habitat for fauna	**Yes**
Mixed broadleaf woodland (WD1)	Scattered throughout area as individual stands or bounding watercourses; largest stand in centre of the study area	Local importance (higher value)	Represents native broadleaf tree species in areas despite some areas being poorly developed due to cattle poaching	**Yes**
Wet Heath (HH3)	North of the study area, outside but adjacent to the footprint of the works	National Importance	Links to Annex I habitat 'Northern Atlantic wet heaths with *Erica tetralix* (4010)', however outside of the development footprint	**Yes**
Upland Blanket Bog (PB2)/Wet Heath (HH3)	Small section in the northwest area of the study area, outside of the development footprint	National Importance	Links to Annex I habitats: 'Upland blanket bog (priority if active) (7130) & 'Depressions on peat substrate of the Rhyncosporion' (7150), however outside of the development footprint	**Yes**
Eroding/Upland Rivers (FW1)	Ten watercourses draining the study area	Local importance (higher value)	Provide habitat for a variety of fauna and hydrological connections with catchments	**Yes**
Stone walls and other stonework (BL1)	Field boundaries	Local importance (lower value)	Little to no intrinsic ecological value	No
Drainage ditches (FW4)	High gradient features at field boundaries	Local importance (lower value)	Little to no intrinsic ecological value	No
Drainage ditches (FW4)	Low gradient features within fields	Local importance (higher value)	Used by spawning frogs	**Yes**

6.3.13.3 Selection of Key Fauna and Flora as Important Ecological Features

The following table (**Table 6-15**) presents an evaluation of the ecological value of the floral and faunal species, excluding birds, identified within the receiving environment of the proposed development and rationale for inclusion, or, exclusion as IEFs.

Table 6-15: Evaluation of flora and fauna within the development area as IEFs

Ecological receptor	Legislative protection	Ecological Value in Context of Study Area	Rationale	Important Ecological Feature
Flora				
Small-white Orchid *(Pseudorchis albida)*	Flora Protection Order (2022)	Local Importance (higher value)	Species was not recorded during field surveying but is previously known from the hectad (R56) and potentially suitable habitat is present throughout the wider study area in grassland habitats not strictly within the development footprint. Precautionary principal.	**Yes**
Reindeer Moss (*Cladonia portentosa*)	Annex V of the EU Habitats Directive (92/43/EEC)	Local Importance (higher value)	Species was not recorded during field surveying but is previously known from the hectad (R56) and potentially suitable habitat is present within the wider study area in upland bog areas such as that in the northwest of the study area. A limited area is within the site boundary however outside the development footprint. Precautionary principal.	**Yes**
Mammals				
Hedgehog (*Erinaceus europaeus*)	Wildlife Acts, 1976 to 2021, as amended	Local importance (higher value)	This species was not recorded on site during ecological walkover; however, suitable habitat exists and there are desktop records in the greater area. This species is protected under national legislation.	**Yes**
Badger (*Meles meles*)	Wildlife Acts, 1976 to 2021, as amended	Local importance (higher value)	Species is protected under national legislation. Badger activity, including 4 setts, recorded within the study area, some located in proximity to proposed works though all outside footprint of development: Badger sett A is located approximately 20m southeast of application boundary of proposed access track between T1 and T2, Badger sett B is located within the northeastern redline boundary of T2 (c. 70m from T2 hard structure) on the west bank of the Cappateemore East River. Badger sett C and D are located along the northern boundary of two adjoining fields north of T9 (c. 60m and 80m from proposed access tracks, respectively).	**Yes**
Pygmy Shrew (*Sorex minutus*)	Wildlife Acts, 1976 to 2021, as amended	Local importance (higher value)	The species is protected under national legislation. Not recorded during ecological surveys but suitable habitat occurs. Precautionary principal.	**Yes**
Red Squirrel (*Sciurus vulgaris*)	Wildlife Acts, 1976 to 2021, as amended,	Local importance (higher level)	The species is protected under national legislation. Not recorded during ecological surveys but suitable habitat occurs. Precautionary principal.	**Yes**

Ecological receptor	Legislative protection	Ecological Value in Context of Study Area	Rationale	Important Ecological Feature
	Bern Convention Appendix III			
Irish hare (*Lepus timidus hibernicus*)	Annex V Habitats Directive, Wildlife Acts, 1976 to 2021, as amended	Local Importance (higher level)	National legal protection, observed during various field surveys in the west and northwest areas of the study area. Consequently, site was considered to contain suitable resting and breeding habitat for the species.	**Yes**
Irish stoat (*Mustela erminea Hibernica)*	Wildlife Acts, 1976 to 2021, as amended	Local Importance (higher level)	The species is protected under national legislation. Recorded once on trail camera during ecological surveys and suitable habitat occurs.	**Yes**
Otter (*Lutra lutra*)	Annex II of the EU Habitats Directive (92/43/EEC) Wildlife Acts, 1976 to 2021, as amended	Local importance (higher level)	Not identified during surveying, no evidence of the species found in study area. Watercourses present are not considered suitable to support otter due to a lack of fish. Precautionary principle.	**Yes**
Pine marten (*Martes martes*)	Annex V Habitats Directive, Wildlife Acts, 1976 to 2021, as amended	Local importance (higher level)	Presence of pine marten was confirmed on trail camera footage. Other evidence of pine martin recorded throughout the study area including scats located along treelines and hedgerows. The study area contains suitable resting and breeding habitat for the species.	**Yes**
All bat species	All bat species are listed in Annex IV of the EU Habitats Directive (92/43/EEC) and the lesser horseshoe bat is listed in Annex II Wildlife Acts, 1976 to 2021, as amended	Local Importance (higher level)	Multiple bat species recorded within the study area, using the site for both foraging and commuting with majority of bat activity attributable to two common species (common and soprano pipistrelle), as well as Leisler's bat.	**Yes**
Terrestrial Macro-Invertebrates				
Marsh Fritillary (*Euphydryas aurinia*)	Annex II species Habitats Directive	Local importance (higher value)	Suitable habitat was identified during field surveys outside the development footprint. Species was recorded within the study area (larval webs); however, this was also outside development footprint.	**Yes**
Other terrestrial macro-invertebrates (bees, butterflies etc.,)	N/a	Local importance (higher value)	The terrestrial insect population in semi-natural terrestrial habitats is important at the lower level of ecosystem food chains, for example, essential for sustenance of bats.	**Yes**
Aquatic species				

Ecological receptor	Legislative protection	Ecological Value in Context of Study Area	Rationale	Important Ecological Feature
Brook lamprey (*Lampetra planeri*)	Annex II and Annex V of the Habitats Directive Wildlife Acts, 1976 to 2021, as amended, Bern Convention Appendix III	Local importance (higher value)	Low densities of brook lamprey are likely to occur within watercourses draining the study area. Suitable lamprey habitat was recorded during aquatic surveys. Lamprey was detected at one site during aquatic surveying.	**Yes**
Atlantic salmon (*Salmo salar*), River Lamprey (*Lampetra fluviatilis*);	Annex II Habitats Directive	Local importance (higher value)	Neither species identified during aquatic surveys. The watercourses in the subbasins encompassing the study area are considered unsuitable for salmon due to their small size. Neither species considered likely to occur in the watercourses potentially affected by the proposed development due to stream size, poor habitat in the lower reaches of these streams and impediments to fish passage; however precautionary principal.	**Yes**
Freshwater White-clawed crayfish (*Austropotamobius pallipes*)	Annex II and Annex V of the Habitats Directive Wildlife Acts, 1976 to 2021, as amended	Local importance (lower value)	Not identified during surveys. Outside species known distribution. Not expected to occur in receiving watercourses.	No
Freshwater Pearl Mussel (*Margaritifera margaritifera*)	Annex II of the Habitats Directive	Local importance (lower value)	Aquatic report concluded species are highly unlikely to occur in the environs of the proposed development.	No
Other fish species added (e.g. Brown trout (*Salmo trutta*), European eel (*Anguilla anguilla*)	N/a	Local importance (higher value)	Brown trout and European eel were recorded during the survey of watercourses draining the proposed development.	**Yes**
Other aquatic macro-invertebrates (aquatic snails, water beetles and other aquatic insects)	N/a	Local Importance (higher value)	The aquatic macroinvertebrate communities are important in the functioning of the aquatic ecosystem of the receiving watercourses.	**Yes**
Reptiles & Amphibians				
Common frog (*Rana temporaria*)	Annex V of the Habitats Directive Wildlife Acts, 1976 to 2021, as amended	Local Importance (higher value)	Some suitable habitats present on site, in the northwest of the study area. Wetter parts of the site are suitable spawning areas and likely used by hibernating frogs, but such habitats are sparse. Adult frog carcasses recorded near spawning sites during surveying of the area.	**Yes**
Smooth newt (*Lissotriton vulgaris*)	Wildlife Acts, 1976 to 2021, as amended	Local importance (lower value)	Not recorded during surveying of the study area, habitat suitability is limited.	No

Ecological receptor	Legislative protection	Ecological Value in Context of Study Area	Rationale	Important Ecological Feature
Common lizard (*Zootoca vivipara*)	Wildlife Acts, 1976 to 2021, as amended	Local importance (lower value)	Not recorded during surveying of the study area. Habitat suitability limited to rocky outcrops throughout northwest and northeast of the study area however, habitat is highly isolated, and species has not been recorded within the R56 hectad.	No

6.3.14 Do-Nothing Scenario

The proposed development site is situated in an area where a well-established pattern of mixed land use pertains both within the application boundary and surrounds. These comprise predominantly agriculture and commercial forestry in the immediate surrounds, complimented by grasslands and various other habitat types. The lands encompassed within the development site are not subject to any form of formal nature designation. If the proposed wind farm development does not progress beyond the planning application stage it is likely that the current land-use practices, including potentially further land reclamation for agriculture, will continue at the proposed development site.

6.4 Assessment of Impacts and Effects

Wind farm developments are projects that may potentially impact on the natural environment (habitats, flora, fauna, water quality, aquatic ecology, and fisheries). For wind farm projects, the construction phase has the potential to have the most significant effect on biodiversity. This section will identify in detail the potential ecological impacts of the construction, operational, and decommissioning phases of the proposed wind farm development on the receiving natural environment. The potential impacts of the proposed project were considered and assessed to ensure that all effects on IEFs are adequately addressed and no significant residual effects are likely to remain following the implementation of mitigation measures.

6.4.1 Construction Phase

The main potential effects associated with the construction phase of the development plan are identified in the points below:

- Habitat loss and alteration effects associated with forestry felling, vegetation clearance, site access tracks, and excavations for turbine foundations and deposition areas, site substation, as well as the temporary construction compound within the site boundary of the proposed project;
- Temporary habitat loss, barriers to animal movements and disturbance as a result of side-casting, and/or stockpiling of material;
- Temporary disturbance and/or displacement of species, potential for injury/mortality as a result of increased activity and physical presence;
- Potential pollution of drains and streams draining the site and of downstream watercourses lower in the catchment, without appropriate mitigation;
- Potential spread of invasive species;
- Habitat loss and alteration.

The construction phase of the proposed development will require excavation and construction within the site, which will bring about habitat loss. It will have a potential impact on flora and fauna. A Biodiversity Enhancement Management Plan is included in Appendix 6E outlining management and enhancement measures for various habitats and species within the study area. A potential impact during construction is disturbance of sheltering or foraging species of fauna by the operation of machinery and other human activity.

This section identifies the impact of the construction phase of the proposed development on the local natural environment.

6.4.1.1 Designated Conservation Sites

Cloonlara House pNHA is the only conservation site (pNHA's are not currently statutorily designated) that was selected as an IEF (see Section 6.3.13.1 above). This pNHA, relates to a population of Leisler's Bat, and is located 4.9 km from the proposed development site (Clare County Council, 2008). Collins (2016) identifies the Core Sustenance Zone (CSZ) for Leisler's bat to be 3 km; however, Marnell et al., (2022) notes that this species will frequently travel > 5km from their roosts to forage. As the proposed development site is located within the known foraging range from roosts for this species, as per Marnell *et al*., (2022), in the context of the pNHA, and considering that Leisler's bat was recorded on-site during the baseline bat surveys (7.2% of passive bat activity registrations), it is considered that, on a precautionary basis, Leisler's bats occurring on-site could potentially comprise part of the pNHA population. The pNHA population could therefore be subject to construction phase effects if individuals were to utilise the proposed development site for foraging during the construction phase.

Habitat loss/vegetation removal (potential foraging/ commuting habitat) effects on individuals from the Cloonlara House pNHA Leisler's bat population are assessed as permanent, slight negative effects.

Disturbance and/or displacement effects on individuals from the Cloonlara House pNHA Leisler's bat population are assessed as short-term, slight negative effects.

6.4.1.2 Habitats and Flora

Habitat loss would result from the construction of turbine bases and hardstands for wind turbines, the construction of the electrical substation, construction of new access tracked and widening of existing tracks, site compound, and underground electrical and communications cabling connecting the turbines to the proposed on-site substation. The network of existing access tracks which would be upgraded and widened, together with new excavated and new floating access tracks would be used to access each of the turbines, substation compound and meteorological mast.

Figure 6-9 and Figure 6-10 illustrate the habitat at the proposed development site overlain by the proposed development infrastructure.

The area of a single hardstand is approximately 68m long by 25m wide. Internal access tracks will have a running width of generally 5m along straight sections, with localised wider areas at bends to accommodate the efficient transport of the wind turbine components. The habitats recorded and their areas of loss, or, in the case of linear habitats, the length of habitat which will be lost to facilitate construction of the proposed development, are provided in Table 6-16 and

Table 6-17 below. Most infrastructure is situated in Conifer Plantation (WD4), Improved Agricultural Grassland (GA1), Improved Agricultural Grassland (GA1)/Wet Grassland (GS4), Dry-humid Acid Grassland (GS3), Improved Agricultural Grassland (GA1)/Dry-humid Acid Grassland (GS3) and Buildings and Artificial Surfaces (BL3).

Electrical cabling will be required between turbines and the site substation. The underground grid cable between the proposed substation and wind farm is confined to an existing forestry track and a firebreak. However, utilising the existing track and firebreak ensures watercourses can be avoided where possible and drainage to watercourses is limited. Any alteration to drainage will be further offset by the proposed drainage system which includes settlement ponds and silt fencing where necessary.

There are some small upland watercourses draining the proposed development site, all of which are classified per Fossitt (2000) as Eroding/Upland Rivers (FW1). The crossing points of the cable within the wind farm will coincide with the crossing points of the proposed windfarm access tracks. New bottomless culverts will be installed to carry both the track and the cable over the crossings within the wind farm. No instream works will be required on any of the EPA mapped streams. Details of the crossing methodologies for the access tracks and cables within the wind farm are provided in Section 3.13.3 of Chapter 3 Civil Engineering.

Operations taking place on-site, such as the movement of materials, can disturb local ecosystems. There is potential to generate dust from extraction of raw material, loading and haulage as well as vehicle movement. This can travel into waterways and can impact upon sensitive habitats thus disrupting wildlife, without appropriate mitigation.

Table 6-16: Areas of habitat loss associated with the Proposed development

Habitat Type	Area of Habitat Loss (Ha)	IEF (Y/N)
Woodland and Scrub habitats and mosaics		
Mixed broadleaved woodland (WD1)	0.05	**Y**
Conifer Plantation (WD4)	15.97	N
Scrub (WS1)	1.62	**Y**
Grassland/Wetland habitat and mosaics		
Improved agricultural grassland (GA1)	7.27	N
Dry meadows and grassy verges (GS2)	N/a	N
Dry-humid Acid Grassland (GS3)	2.22	**Y**
Improved agricultural grassland (GA1)/Dry-humid-acid grassland (GS3)	1.83	N
Improved agricultural grassland (GA1)/Wet grassland (GS4)	2.22	N
Wet grassland (GS4)	N/a	N
Wet grassland (GS4)/Scrub (WS1)	N/a	**Y**
Wet grassland (GS4)/Wet heath (HH3)	0.0009	**Y**
Wet grassland (GS4)/Dry-humic-acid grassland (GS3)	N/a	N
Dense Bracken (HD1)	0.11	N
Dense bracken (HD1)/Conifer plantation (WD4)	0.09	N
Wet Heath (HH3)	N/a	**Y**
Upland Blanket Bog (PB2) / Wet Heath (HH3)	N/a	**Y**
Cultivated and Built Land habitats and mosaics		
Stone walls and other stonework (BL1)	N/a	N
Spoil and bare ground (ED2)	0.15	N
Active Quarries and Mines (ED4)	N/a	N
Buildings and artificial surfaces (BL3)	0.58	**Y**

Table 6-17: Areas of linear habitat loss (length of loss of linear features) associated with the proposed development

Habitat Type	Length of Habitat Loss (m)	IEF (Y/N)
Hedgerows (WL1)	849	Y
Treelines (WL2)	15	Y
Eroding/upland river (FW1)	158	Y
Drainage ditches (FW4)	58	Y

Table 6-18 below assesses the direct and potential indirect construction phase effects on the habitats included as Important Ecological Features, without the implementation of appropriate mitigation measures..

Table 6-18: Construction stage potential effects on Important Ecological Feature (habitats) without mitigation

Important Ecological Feature	In-situ Impact	In-situ/Ex-situ effect	Description of Unmitigated Impact	Significance of Unmitigated effects (NRA, 2009 & EPA, 2022)
Woodland and scrub habitats				
Mixed broadleaved woodland (WD1)	Habitat Loss	Habitat loss, loss of habitat connectivity, alteration	Habitat Loss The proposal will require 0.05ha loss of this habitat type. However, majority of areas have been avoided and are outside planning application boundary. Habitat Alteration/Disturbance Habitat disturbance may occur due to encroachment from works areas, side-casting of materials or spread of invasive species.	Habitat loss effects are assessed as **Permanent, Likely Not Significant Negative Effects.** Habitat disturbance effects are assessed as **Short-term, Likely Moderate Negative Effects.**
Oak-Birch-Holly Woodland (WN1)	Unlikely	Habitat alteration	Habitat Loss There will be no loss of this habitat as a result of the proposal. This habitat is located outside the Proposed development area. Habitat Alteration/Disturbance Habitat alteration may occur due to potential spread of invasive species given that this area of woodland adjoins a stream draining the proposed development site.	Habitat disturbance effects are assessed as being **Short-term, Likely Moderate Negative Effects**.
Scrub (WS1)	Habitat Loss	Habitat loss and loss of habitat connectivity	Habitat Loss The proposal will require 1.62 ha loss of this habitat type. Habitat Alteration/Disturbance Habitat disturbance may occur due to encroachment from works areas, side-casting of materials or spread of invasive species.	Direct habitat loss effects are assessed as **Permanent, Likely Moderate, Negative Effects**. Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Hedgerows (WL1) / Treelines (WL2)	Habitat Loss	Habitat loss and loss of habitat connectivity.	Habitat Loss The proposal will require the loss of 849m of hedgerow and 15m of treeline habitat. Habitat Alteration/Disturbance Habitat disturbance may occur due to encroachment from works areas, side-casting of materials or spread of invasive species.	Direct habitat loss effects are assessed as **Permanent, Likely Significant, Negative Effects**. Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Grassland/ Wetland habitats and mosaics				

Important Ecological Feature	In-situ Impact	In-situ/Ex-situ effect	Description of Unmitigated Impact	Significance of Unmitigated effects (NRA, 2009 & EPA, 2022)
Dry-humid Acid Grassland (GS3)	Habitat Loss	Habitat loss and loss of habitat connectivity	Habitat Loss The proposal will require a 2.22ha loss of this habitat. Habitat Alteration/Disturbance Habitat disturbance may occur due to encroachment from works areas, side-casting of materials or spread of invasive species.	Direct habitat loss effects are assessed as **Permanent, Likely Moderate Negative Effect** Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Wet Heath (HH3)	Unlikely	Habitat alteration /disturbance	Habitat Loss There will be no loss of wet heath as a result of the proposal. This area of habitat is located outside the proposed development site. Habitat Alteration/Disturbance This habitat is located adjacent/in close proximity to the proposed development site. Habitat disturbance may occur due to encroachment from works areas, side-casting of materials, spread of invasive species. New access tracks will require removal of soil which will affect groundwater flow by the localised lowering of the water table and diversion of near-surface groundwater flow into drains and channels therefore affecting recharge ability of upland heaths.	Habitat disturbance effects are assessed as **Permanent, Likely, Slight Negative Effects.**
Wet Grassland (GS4)/ Wet Heath (HH3)	Habitat Loss	Habitat loss and loss of habitat connectivity	Habitat Loss The proposal will require 0.0009ha loss of this habitat. Habitat Alteration/Disturbance Habitat disturbance/alteration may occur due to encroachment from works areas, side-casting of materials, spread of invasive species and/or hydrological impacts due to the proximity of the construction zone at T1.	Direct habitat loss effects are assessed as **Permanent, Likely Moderate Negative Effect** Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Wet Grassland (GS4)/ Scrub (WS1)	Unlikely	Loss of habitat connectivity	Habitat Loss The proposal will not require any loss of this habitat. Habitat Loss / Alteration Habitat loss and alteration may occur due to encroachment from works areas, side-casting of materials, spread of invasive species and/or hydrological impacts due to the proximity of the construction zone at T4 and T7 and long proposed access track between T4 and T3.	Habitat Loss/Alteration effects are assessed as **Short-term, Likely Slight Negative Effects**

Important Ecological Feature	In-situ Impact	In-situ/Ex-situ effect	Description of Unmitigated Impact	Significance of Unmitigated effects (NRA, 2009 & EPA, 2022)
Upland Blanket Bog (PB2) / Wet Heath (HH3)	Unlikely	Habitat alteration/disturbance	Habitat Loss Although partially encompassed within the proposed development site, there will be no loss of upland blanket bog/wet heath habitat as a result of the proposal. Habitat Alteration/Disturbance Habitat disturbance/alteration may occur due to encroachment from works areas, side-casting of materials, spread of invasive species and/or hydrological impacts due to the proximity of the construction zone at T1.	Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Cultivated and Built land habitats and mosaics				
Buildings and Artificial Surfaces (BL3)	Habitat Loss	Habitat loss and loss of habitat connectivity	Habitat Loss The proposal will require 0.58 ha use of this habitat-type comprising existing tracks, farm tracks and other artificial surfaces. No buildings will be demolished as part of the proposed development. Habitat Alteration/Disturbance Habitat disturbance may occur from noise from construction in the vicinity of derelict buildings.	Direct habitat loss effects are assessed as **Permanent, Likely Moderate Negative Effects.** Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects.**
Freshwater aquatic habitats				
Eroding/upland rivers (FW1)	Habitat loss Impairment of water quality	Impairment of downstream water quality	Habitat Loss There will be approximately 158 m (total length) of this habitat type altered within the proposed development site. The culvert will be bottomless and there will be no instream works, so there will be no direct loss substrate habitats. There will however be loss of primary instream production and reduced macroinvertebrate diversity and abundance due to a reduction of light. Habitat Alteration Potential indirect effects due to deterioration of water and stream habitat quality as a result of potential run of silt/sediment, ingress of cementitious material, fuel or oil and /or impacts on flow regime and in-stream vegetation.	Direct effects relating to loss of substrates habitats are assessed as **None**. Direct macroinvertebrate habitat loss effects are assessed as **Permanent, Likely Moderate Negative Effects.** Habitat alteration effects are assessed as **Permanent, Likely Moderate Negative Effects.** **Moderate Negative Effects** with regards to aquatic ecology and water quality.

Important Ecological Feature	In-situ Impact	In-situ/Ex-situ effect	Description of Unmitigated Impact	Significance of Unmitigated effects (NRA, 2009 & EPA, 2022)
Drainage ditch (FW4)	Habitat loss	Impairment of water quality	Habitat Loss There will be approximately 58m (total length) of this habitat type within the proposed development site covered due to hard stands and an access track. Habitat Alteration Potential indirect effects due to deterioration of water and stream habitat quality as a result of potential run of silt/sediment, ingress of cementitious material, fuel or oil and /or impacts on flow regime and in-stream vegetation.	Direct habitat loss effects are assessed as **Permanent, Likely Moderate Negative Effects.** Habitat alteration effects are assessed as **Short-term, Likely Slight Negative Effects.**

Invasive Alien Plant Species (IAPS)

Both Japanese knotweed and Himalayan balsam were identified within the study area. Infestations of Himalayan Balsam were extensive, recorded within the core proposed wind farm area and along the proposed turbine delivery route. Japanese knotweed was recorded in two locations within the study area; a small infestation of not-yet-established plants on a farm track, and a more mature but single plant located on a hedgerow bounding a farm track.

An Invasive Species Management Plan (ISMP) will be implemented as part of the EIAR and is included as part of the report (refer to Appendix 6F).

Without intervention, Invasive Alien Species (IAS) could spread within the proposed development site during construction works via movement of vehicles such as excavators and dumpers. The introduction of IAS to a location free of such plants could have serious implications for habitats, especially given the dynamic context of the centre and southeast section of the site where extensive infestations of Himalayan balsam occur and where infestation may be accelerated in combination with proposed works.

The significance of the presence of IAS infestations in the context of the proposed works during the construction phase of the proposed development is assessed as a long-term, likely moderate negative effect.

Rare and Protected Flora

Neither small-white orchid or reindeer moss were recorded within the study area during ecological field surveys, and there are no previous species records available from the site; however, both species are previously known from the hectad (R56). Potentially suitable habitat for both species occurs within the study area (comprising dry upland grassland and peatland habitats respectively).

The design phase of the project has predominantly avoided development in the areas of higher quality habitats with which these species are associated; however, a very limited area of these habitats (0.0009ha) will be lost as part of the construction phase of the development (see Table 6-16 above). On a precautionary basis, direct habitat loss within the footprint of the proposed development with regard to these species is assessed as a permanent, likely, imperceptible negative effect.

6.4.1.3 Non-Volant Mammals

The following table below (Table 6-19) describes the potential construction phase effects on non-volant mammal species identified as Important Ecological Features (IEFs) (excluding bats) at the proposed development site, as well as the significance of the effect, without the implementation of appropriate mitigation measures.

In terms of potentially significant disturbance/displacement of species, it is considered that increased activity at the site during the construction phase are likely to occur. However, these activities will be restricted to daylight hours and having regard for the fact that the number of individuals habitually present will be low it can be considered that the potential disturbance or displacement effects are likely to be inconsequential.

Table 6-19: Construction stage potential effects on Important Ecological Feature terrestrial species without mitigation

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Otter	Not identified during surveying. Watercourses on-site identified as being sub-optimal for otter. Evaluated as Local importance (higher value)	Habitat Loss None expected. Habitats which will be lost as a result of the proposal are not considered to be of particular ecological value to otter. No evidence of breeding and resting places within the site. Disturbance and/or Displacement On a precautionary basis, direct disturbance and/or displacement effects on otter could potentially ensue as a result of increased noise, lighting and human activity if otters were to occur within the vicinity of construction works. It is noted that agricultural, and forestry activities comprise the majority of on-going land-use at the development site and in immediate environs. Indirect disturbance and/or displacement effects on otter could potentially ensue due to water quality impacts which could impact on otter foraging/commuting habitat and/or prey biomass in rivers. Watercourses on-site identified as being sub-optimal for otter; however, extensive suitable habitat for foraging is located downstream of the proposed development site.	No habitat loss effects on otter predicted. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term, Slight Negative Effects.** Indirect disturbance and/or displacement effects during the construction phase are assessed as **Temporary to Short-term, Slight to Significant Negative Effects.**
Badger	The habitats occurring at the site provide foraging and breeding/resting habitat for badger. Ecological surveys determined that badger use the site for foraging, resting and likely breeding. Presence of badger confirmed within the site. Multiple badger setts recorded (4 No.), some within proximity of the works. Fifty desk-top study NBDC records of the species occurring in the R56 10km^2 hectad, most recent record entered in 2015. Evaluated as Local Importance (Higher Value).	Habitat Loss Woodland and agricultural habitats which will be lost provide foraging and breeding/resting habitat for badger. These habitat types are widespread within the larger study area. No loss or disturbance of badger setts identified during field surveys is proposed as part of the works. Existing badger setts will be retained. Disturbance and/or Displacement Four badger setts were confirmed present within the study area with the closest badger sett located approximately 20m from the nearest point of the proposed application boundary. Considering the scale of the proposed works, there is potential for disturbance and/or displacement effects as a result of increased noise and human activity at the site during the construction phase. It is noted that agricultural and forestry activities comprise on-going land-use at the development site.	Habitat loss effects on badger (loss of potential foraging and potential breeding/resting habitat) assessed as a **Short-term Slight Negative Effect.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Moderate Negative Effects.**
Pine marten	Presence of pine marten confirmed within the site during camera surveys. Scat was located in wooded areas, along treelines and hedgerows. Consequently, suitable foraging and breeding/resting habitat is considered to occur at the subject site. Twelve counts of this species have	Habitat Loss The woodland, treeline and hedgerow habitat which will be lost provides potential foraging and breeding/resting habitat for pine marten. This habitat type is widespread within the overall site. Disturbance and/or Displacement	Habitat loss effects on pine marten are assessed as **Short-term Slight Negative Effects.**

	been recorded within the R56 hectad, with most recent counts being entered in 2021. Evaluated as Local Importance (Higher Value).	Direct disturbance and/or displacement effects could arise as a result of increased noise, lighting and human activity at the site during the construction phase.	Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**
Irish Hare	Observed in the northwest and western areas of the site during surveys; suitable foraging and breeding/resting habitat was considered to occur at the subject site. Approximately two counts of the species have been recorded in the R56 hectad with most recent counts being recorded in 2015. Evaluated as Local Importance (Higher Value).	Habitat Loss The grassland and scrub habitats which will be lost provide potential foraging and breeding/resting habitat for Irish hare. These habitats are common and widespread within the overall site. Disturbance and/or Displacement Direct disturbance and/or displacement effects could arise as a result of increased noise and human activity at the site during the construction phase.	Habitat loss effects on Irish hare are assessed as **Short-term slight Negative Effects.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**
Irish Stoat	Recorded once on trail camera during surveying and suitable foraging and breeding/resting habitat occurs at the subject site. One count of the species occurring has been recorded in NBDC records from 2015 from the R56 hectad. Evaluated as Local Importance (Higher Value).	Habitat Loss The woodland/scrub/hedgerow/treeline habitats which will be impacted provide potential foraging and breeding/resting habitat for Irish stoat. Woodland habitat occurs throughout the site. Disturbance and/or Displacement Direct disturbance and/or displacement effects could arise as a result of increased noise and human activity at the site during the construction phase.	Habitat loss effects on stoat are assessed as **Short-term Slight Negative Effects.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**
European Hedgehog	Not recorded during surveys but suitable foraging and breeding/resting habitat occurs at the subject site. Six counts of this species have been recorded from the NBDC records of the R56 hectad. Most recent counts of the species were recorded in 2020. Evaluated as Local Importance (Higher Value).	Habitat Loss Habitats which will be lost provide potential foraging and breeding/resting habitat for hedgehog. These habitat types are common and widespread in the greater area. Disturbance and/or Displacement Direct disturbance and/or displacement effects could arise as a result of increased noise and human activity at the site during the construction phase.	Habitat loss effects on hedgehog are assessed as **Short-term Slight Negative Effects.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**
Pygmy shrew	Not recorded during surveys but suitable foraging and breeding/resting habitat occurs at the subject site. The species has been recorded twice, most recently in 2018, from NBDC records. Evaluated as Local Importance (Higher Value).	Habitat Loss The habitats which will be lost provide potential foraging and breeding/resting habitat for pygmy shrew. These habitat types are common and widespread in the greater area. Disturbance and/or Displacement Direct disturbance and/or displacement effects could arise as a result of increased noise and human activity at the site during the construction phase.	Habitat loss effects on pygmy shrew are assessed as **Short-term Slight Negative Effects.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**

Red Squirrel	Not recorded during surveys but suitable habitat for foraging and breeding/resting available within the subject site. The species has not been recorded within the proposed development site, however nearby sightings of the species have been recorded as recently as 2022, from NBDC records. Evaluated as Local Importance (Higher Value)	Habitat Loss The habitats which will be lost provide potential foraging and breeding/resting habitat for red squirrel. These habitat types are common and widespread in the greater area. Disturbance and/or Displacement Direct disturbance and/or displacement effects could arise as a result of increased noise and human activity at the site during the construction phase.	Habitat loss effects on red squirrel are assessed as **Short-term Slight Negative Effects.** Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects.**

6.4.1.4 Bats

Wind turbines and associated infrastructure present three main potential construction phase impacts to bats, namely:

- Collision mortality, barotrauma and other injuries;
- Loss or damage to commuting and foraging habitat;
- Loss of, or damage to, roosts;
- Displacement of individuals or populations.

Whilst the study area is predominantly composed of intensive agricultural grasslands with a general lack of roosting opportunities, the foraging and commuting habitat is suitable with good connectivity to the surrounding habitats. Pasture-based agriculture will continue in undeveloped areas of the site post-construction and this impact of foraging habitat loss to bats is likely to be not significant.

Whilst linear habitat features such as hedgerows and treelines are common features in the wider landscape, the loss of these commuting habitats will potentially displace some bats in the immediate environs of the works and marginally reduce habitat connectivity. It should be noted that, in the context of wind farm development, it is preferrable to reduce habitat connectivity in the immediate locality of turbines to reduce the potential for collision and barotrauma to occur.

No bat roosts were confirmed within the study area and bat activity recorded was moderate overall. While it is considered that there is no potential for a significant bat roost to occur within the relevant distance of the proposed wind farm development (NatureScot, 2021), it is possible that individual bats or small numbers of bats may roost in trees or existing structures at least occasionally and mitigation measures will be applied to minimise the potential effects on bats associated with construction related disturbance. No significant tree roost locations suitable to support large numbers of roosting bats were noted along the grid route. Trees proposed for removal within the wind farm site are considered to be mostly of low suitability.

Construction phase lighting has potential to attract certain bat species and displace others, however this will be temporary in nature, relatively localised around the site compound, and limited to standard construction hours which are mostly during daylight hours.

Overall, the potential effects on bats during the construction phase of the proposed wind farm developments are considered to be **slight negative**. Details of the construction phase impacts can be found in **Appendix 6A Bat Survey Report**, the results of which are summarised in the table below (**Table 6-20**).

Table 6-20: Construction stage potential effects on Important Ecological Feature bat species without mitigation

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
All Bat Species (Common pipistrelle, soprano pipistrelle, brown long-eared bat,	Relatively moderate levels of bat activity recorded in the site.	Habitat Loss Habitat loss will comprise mainly conifer plantation (15.97ha) and linear features hedgerows (849m) and treelines (15m) which provide foraging and commuting habitat for bats. Similar habitat of equivalent ecological value is abundantly available	Habitat loss/vegetation removal (potential foraging/ commuting habitat) effects on bat species are assessed as **permanent, slight negative effects**.

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
lesser horseshoe bat, Leisler's bat, *Myotis* spp., Nathusius' bat, Daubenton's bat)		within and adjacent to the proposed development site. Disturbance/Displacement Surveys determined a variety of bat species to be using the site for foraging and commuting. Direct/indirect disturbance and/or displacement effects on foraging/commuting bats could arise as a result of construction-related disturbances, increased lighting and human activity at the site during the construction phase.	Disturbance and/or displacement effects on bat species during the construction phase are assessed as **short-term, slight negative, effects.**

6.4.1.5 Terrestrial Macro-Invertebrates

Marsh fritillary is the only species of protected terrestrial macro-invertebrate considered to comprise an IEF for the Proposed development. The NBDC Habitat Condition Assessment (HCA) survey undertaken for marsh fritillary identified two areas of 'good condition' habitat within the study area. Species larval webs were recorded in one of these areas (Field B, comprising mosaic of grassland habitats). Walkover surveys identified areas of devil's bit scabious (*Succisa pratensis*) in other parts of the site (e.g., near T7); however, following the HCA survey, these areas were determined to be unsuitable for marsh fritillary, as per the survey criteria. Please see **Appendix 6D** for more information.

The following table below (**Table 6-21**) describes the potential construction phase effects on terrestrial macro-invertebrates identified as Important Ecological Features at the Proposed development site, as well as the significance of the effect, without the implementation of appropriate mitigation.

Table 6-21: Construction stage potential effects on Important Ecological Feature terrestrial macro-invertebrate species without mitigation

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Marsh Fritillary	The Habitat condition assessment survey identified two areas of good condition habitat within the study area. Species larval webs recorded in one of these areas. NBDC records have nine counts of the species occurring in the R56 hectad. Most recent counts recorded in 2017.	Habitat Loss The two areas identified to comprise/contain 'good condition' marsh fritillary habitat have been excluded from the development site and therefore, there will be no habitat loss. Habitats encompassed within the development site are considered to comprise 'unsuitable' habitat for this species as per survey criteria.	No habitat loss effects for marsh fritillary predicted due to unsuitable nature of the habitats encompassed within the development site. Indirect disturbance and/or displacement effects are assessed as **Short-term, Moderate Negative Effects.**

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
		Disturbance and/or Displacement All areas of good condition/suitable habitat have been avoided. Some areas of habitat occurring outside of but in proximity to the works comprise confirmed habitat for this species. There is potential, on a precautionary basis, for habitat alteration and thus indirect species disturbance/ displacement impacts in the event of alteration in hydrological regime/drainage, potentially impacting these areas.	
Other terrestrial macro-invertebrates	Habitats within the Proposed development site support a wide variety of terrestrial macro-invertebrate species.	Habitat Loss/alteration Habitat loss will result in the loss of terrestrial macroinvertebrate habitat and therefore reduce the abundance and potentially the diversity of this group. The impact of the Proposed development is at a local scale. Higher value semi-natural habitats will be reinstated.	Habitat loss/alteration effects on other terrestrial macro-invertebrate species are assessed as **temporary to permanent, slight to moderate negative effects.**

6.4.1.6 Freshwater Aquatic Species

The following table below (**Table 6-22**) describes the potential construction phase effects on freshwater aquatic species (freshwater fish and invertebrate species) identified as Important Ecological Features at the Proposed development site, as well as the significance of the effect, without the implementation of appropriate mitigation measures.

Table 6-22: Construction stage potential effects on Important Ecological Feature fish and invertebrate species without mitigation

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Fish			
Atlantic Salmon	Fish habitat evaluations determined the watercourses within the potential development area are not particularly suited for salmonids and as such, Atlantic salmon are not considered likely to occur. The downstream population is evaluated as being of National Importance as Atlantic salmon is a qualifying interest species for the downstream Lower River Shannon SAC (002165).	<u>Habitat Loss</u> The proposed development will require culverting of approximately 158 m of 1st order rivers or streams. Watercourses within the development area were not considered to contain suitable habitats for salmon. Furthermore, as no instream works are required as part of culvert installation on watercourses, no salmon habitat loss effects are considered to occur. <u>Disturbance and/or Displacement</u> The proposed development has avoided in-stream works. Potential water quality impacts as a result of the proposal could result in indirect disturbance/ displacement impacts on salmon downstream of the site. Potential indirect impacts may include increased in-stream siltation and consequently lead to deterioration of water quality and river habitat, which could impact on prey biomass for salmon amongst other effects.	No habitat loss effects on Atlantic salmon are predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Moderate Negative Effects.**
River Lamprey	Fish habitat evaluations determined the watercourses within the potential development area are not particularly suited for	<u>Habitat Loss</u> The proposed development will require culverting of approximately 158m of 1st order rivers or	No habitat loss effects on river lamprey predicted.

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
	lamprey species. River lampreys are not considered likely to occur. The downstream population is evaluated as being of National Importance as river lamprey is a qualifying interest species for the downstream Lower River Shannon SAC (002165).	streams. Furthermore, as no instream works are required as part of culvert installation on watercourses, no river lamprey habitat loss effects are considered to occur. <u>Disturbance and or Displacement</u> The proposed development has avoided in-stream works. Potential water quality impacts as a result of the proposal could result in indirect disturbance/ displacement impacts on river lamprey downstream of the site. Potential indirect impacts may include deterioration of water quality and river habitat, which could also impact on prey biomass for the species.	Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Moderate Negative Effects.**
Brook Lamprey	Fish habitat evaluations determined that low densities of brook lamprey are likely to occur within the watercourses draining the site. The downstream population is evaluated as being of National Importance as brook lamprey is a qualifying interest species for the downstream Lower River Shannon SAC (002165).	<u>Habitat Loss</u> The proposed development will require culverting of approximately 158m of 1st order rivers or streams. Furthermore, as no instream works are required as part of culvert installation on watercourses, no brook lamprey habitat loss effects are considered to occur. <u>Disturbance and or Displacement</u> The proposed development has avoided in-stream works. Potential water quality impacts as a result of the proposal could result in indirect disturbance/ displacement impacts on brook lamprey downstream of the site. Potential indirect impacts may include deterioration of water quality and river habitat, which could also impact on prey biomass for the species.	No habitat loss effects on brook lamprey predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Significant Negative Effects.**

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Other fish species	Brown trout (*Salmo trutta*) and European eel (*Anguilla Anguilla*) were recorded during the survey of watercourses draining the proposed development area. Watercourses in the aquatic report's study area downstream of the proposed development site contain plentiful rocks which provide good suitable habitat for trout and eel. Rocks in the watercourses draining the proposed development site are considered important refuges for European eel.	<u>Habitat Loss</u> The proposed development will require culverting/piping of approximately 158m of 1st order rivers or streams. Furthermore, as no instream works are required as part of culvert installation on watercourses, no habitat loss effects are considered to occur. <u>Disturbance and or Displacement</u> The proposed development has avoided in-stream works. Potential water quality impacts as a result of the proposal could result in indirect disturbance/ displacement impacts on other fish species, namely brown trout and European eel, downstream of the site. Potential indirect impacts may include deterioration of water quality and river habitat, which could also impact on prey biomass for the species.	No habitat loss effects on Brown Trout or European eel are predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Significant Negative Effects.**
Aquatic Macro-invertebrates (excluding FWPM and white-clawed crayfish)	Aquatic surveying of watercourses draining the proposed development area rated habitat for aquatic macroinvertebrates as marginal-suboptimal. Species recorded were common and largely pollution tolerant species with the communities recorded showing reduced diversity. Some watercourses were physically degraded by anthropogenic activities including agricultural practices and stream crossings, the latter of which is a key issue in this regard.	<u>Habitat Loss</u> The proposed development will require culverting/piping of approximately 158m of 1st order rivers or streams. As no instream works are required as part of culvert installation on watercourses, no macroinvertebrate habitat loss effects are considered to occur. <u>Disturbance and or Displacement</u> The proposed development has avoided in-stream works. Potential water quality impacts as a result of the proposal could result in indirect disturbance	No habitat loss effects on aquatic macroinvertebrate species are predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight Negative Effects.**

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
		to aquatic macroinvertebrate species downstream of the site. Potential indirect impacts may include deterioration of water quality and alteration of habitat.	

6.4.1.7 Reptiles & Amphibians

Common frog was the only species of amphibian selected as an IEF. No reptiles (common lizard) were selected as an IEF. The table below (**Table 6-23**) details potential effects to common frog at the construction stage of the proposed wind farm development, without implementation of appropriate mitigation measures.

Table 6-23: Construction stage potential effects on Important Ecological Feature amphibians (common frog) without mitigation

Important Ecological Feature	Extent/Location	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Common Frog	Proposed development area has suitable foraging and breeding/resting habitat for all life stages of frog. Wet grassland and peatland habitats are considered to be important for froglets and adult feeding. Evaluated as Local Importance (Higher Value).	<u>Habitat Loss</u> The habitats which will be lost provide potential foraging and resting habitat for common frog. These habitat types are common and widespread in the greater area. <u>Disturbance/Displacement</u> Direct disturbance and/or displacement effects on common frog could potentially ensue as a result of increased noise and human activity. Indirect disturbance and/or displacement effects on common frog could potentially ensue as a result of water quality impacts to frog foraging/breeding/resting habitat.	Habitat loss effects on common frog are assessed as **Long-term, Moderate Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**. Indirect disturbance and/or displacement effects during the construction phase are assessed as **Temporary to Short-term, Slight to Moderate Negative Effects**.

6.4.1.8 Water Quality

As part of the aquatic survey report (see **Appendix 6C**), water samples were taken from 10 river sites in June of 2021 and 2023. Results from surveys carried out by MWP in 2018 are included for an 11th site. Site 12 was unsuitable for assigning a Q-rating or any other biotic index due to its small size, marginal habitat and difficult access. The following physico-chemical parameters were assessed: Ammonia, Total Ammonia, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Nitrite, Orthophosphate, Suspended Solids, Total Phosphorus, Total Hardness, Total Dissolved Solids, and Total Organic Carbon (TOC). Water levels and conditions were noted at the time of the survey.

Each site was assigned a chemical status on a scale of High-Good-Moderate-Poor-Bad based on water quality standards given in Surface Water Regulations 2019-15 and the Salmonid Water Regulations (1998)[36].

In 2021, biological water quality was satisfactory (Good-High status) in the upper reaches of streams in the Crompaun and North Ballycannan subbasins, with the exception of the upper reach of the North Ballycannan

[36] http://www.irishstatutebook.ie/eli/1988/si/293/made/en/print

Stream (Site 6), which was moderately impacted. Biological water quality varied between Q3-4 to Q4-5. Substrate siltation could explain the reduced biological diversity and subsequent biological water quality recorded in the study area. In a detailed study carried out by Davis et al. (2018), sediment, phosphorus and nitrogen were manipulated simultaneously. Davis et al. (2018) concluded that sediment was the most pervasive stressor particularly at high cover levels. Problems in watercourses arise from smothering of coarse patches of sediment with fine particles that ingress into the coarse sediment and deplete oxygen levels by reducing through-flow within the sediment (Walsh et al., 2012)[37]. The negative impacts of high and persistent sediment loads affect invertebrate assemblages and abundances, with Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa exhibiting the greatest negative response to increased sediment[38].

Declines in biological water quality were recorded from 2021 to 2023 at three locations and are partly contributable to substrate siltation. An improvement in biological quality was recorded at Site 6 on the North Ballycannan Stream between 2021 and 2023. Water levels were also higher in 2023 compared to 2021. The North Balllycannan Stream was considered to have a critically low flow in 2021 which could have contributed to the ecological change between 2021 and 2023, as reduced flow limits the extent and quality of habitats for aquatic macroinvertebrates. Streams represented on-site are sensitive to changes in nutrient-loading and flow, likely due to their small size and low assimilation capacity.

Suspended solids levels in water samples taken during 2021 were all below 25mg/l but samples were taken after a dry period with little overland flows. During slightly elevated water levels in June 2023, all samples were below 25mg/l. It is clear that land management and associated activities were having an adverse effect on water quality in the streams within the proposed development site. Based on the results of the current surveys, it is concluded that the main water quality problems in the study are consistent with those documented by the EPA i.e., agricultural and domestic waste-water.

The watercourses potentially affected by the development are small streams with gradients decreasing with distance from the Proposed development. These streams are generally shallow and have some water quality issues persisting.

Incorrect practices in land use and improper management during the construction phase of developments can lead to excessive runoff of silt, nutrients, and organic matter during heavy rainfall. Consequently, any construction on site may affect water quality for which mitigation will be implemented.

The potential effect of the construction phase to water quality without implementation of appropriate mitigation measures is determined to be a potentially **likely short-term significant negative effect** due to the potential for increased sediment load to occur in local watercourses as a result of the proposed wind farm development. It is considered that water quality can be protected with appropriate mitigation.

6.4.2 Operational Phase

The operational phase of the Proposed development will not involve any additional removal of habitat nor any point source discharges, and there will be no other material releases that would cause adverse effects on surface waters. Wind turbines, and their associated equipment, use lubricating and insulating oils in a closed system. **Chapter 8 Water** describes that the increase in surface runoff from the proposed development poses a **slight negative direct reversible likely** effect prior to mitigation and that the increase in surface runoff will be negligible compared to the flows of the receiving waters.

[37] https://www.epa.ie/pubs/reports/water/rivers/EPA_River_Sediment_Studies.pdf
[38] https://www.salmon-trout.org/wp-content/uploads/2017/09/STC-The-impact-of-excess-fine-sediment-on-invertebrates-and-fish-in-riverine-systems.pdf

Once the construction phase has ceased large scale excavation will no longer be required, which will reduce the potential for sediment run off from the site. Following site reinstatement and re-vegetation of bare areas any potential water quality effects are assessed as **Short-term Slight to Imperceptible Negative Effects**.

The main operational impacts of the Proposed development will arise from the rotation of the blades of the proposed 12 wind turbines and, to a lesser extent, from occasional movement of maintenance vehicles and site personnel along access tracks, and at turbine locations.

This section identifies the effect of the operational phase of the Proposed development on the local natural environment.

6.4.2.1 Designated Sites

Cloonlara House pNHA is the only conservation site that was selected as an IEF (see **Section 6.3.13.1** above). This pNHA, associated with a population of Leisler's Bat, is located 4.6 km from the proposed development site. Collins (2016) identifies the Core Sustenance Zone (CSZ) for Leisler's bat to be 3 km; however, Marnell et al., (2022) notes that this species will frequently travel > 5km from their roosts to forage. As the proposed development site is located within the known foraging range from roosts for this species, as per Marnell *et al*., (2022), in the context of the pNHA, and considering that Leisler's bat was recorded on-site during the baseline bat surveys (7.2% of all passive bat registrations), it is considered that, on a precautionary basis, Leisler's bats occurring on-site could potentially comprise part of the pNHA population. The pNHA population could therefore be subject to operational phase effects if individuals were to utilise the proposed development site for foraging during the operational phase.

The impacts and effects that could ensue on this pNHA, without the implementation of appropriate mitigation measures are characterised in the table below (**Table 6-24**).

Table 6-24: Operational stage potential effects on Important Ecological Feature (Cloonlara House pNHA) without mitigation

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
Cloonlara House pNHA	There is potential that operational wind turbines could impact the population of Leisler's Bat (*Nyctalus leisleri*) for which Cloonlara House pNHA is designated. This pNHA comprises one of the biggest nursery sites for this species in Ireland and Europe. Injury/mortality could arise due to collision/barotrauma associated with rotating turbine blades. Disturbance/displacement of foraging/commuting Leisler's bats could occur due to increased lighting.	Operational phase effects are assessed as **Long-term, Slight Negative Effects**.

6.4.2.2 Habitats and Flora

During the operational phase of the Proposed development, significant effects on habitats and flora are not anticipated. No additional habitat loss is required as part of the operational phase.

No fuel or oil spills are likely to occur due to the limited use of plant and machinery that will be required during the operational phase. In the unlikely event that a spill was to occur the significance of any potential effects will be ameliorated by the inherent limiting effects of the small volumes and the fact that any dispersal plume will not percolate through the soil beyond the immediate footprint of the spill area. During reinstatement, bare areas at the site, including felled areas around turbines will be re-vegetated, reducing the potential for encroachment of invasive and ruderal species, and also reducing any potential for increased run off from the site.

However, during operation of a wind farm, any medium and long-term impacts are typically associated with the permanent site infrastructure such as access tracks, turbine bases and hard standings (Natural England, 2010) which, in the case of this proposed development, are sited primarily in grassland and forestry habitats.

While impacts during the operational phase may be lower in magnitude, the proposed development is likely to operate for up to 35 years. Impacts associated with the operational phase include sediment release and chemical pollution, alteration of surface water flows by new drainage systems as well as localised disruption of flow paths near turbine stands and water table lowering near drainage ditches. Alteration of flow pathways can alter erosion potential downstream due to changes in runoff patterns and/or changes in sediment supply.

Regarding the upland blanket bog mosaic habitat located in the northwest of the proposed development area, it is considered that this habitat has been altered by the existing network of drains which have lowered the water table. The area has been avoided by design and as a result, the operation of the proposed development is unlikely to result in significant effects on the habitat.

Consequently, the potential effects on terrestrial habitats and flora, identified as IEFs in **Table 6-14** above, during the operational phase of the proposed project, in the absence of mitigation, are assessed as **Long-term Imperceptible Negative** effects.

The potential effects on aquatic habitats, comprising 'Eroding/Upland rivers (FW1)' and 'Drainage ditches (FW4)' during the operational phase of the proposed project, in the absence of mitigation, are assessed as **Long-term Slight Negative** effects.

6.4.2.3 Non-volant Mammals

No significant disturbance and/or displacement impacts are expected to protected mammals selected as IEFs, outlined in **Section 6.4.1.3**, **Table 6-19** above. Once the construction phase of the Proposed development has been completed, any individuals of protected non-volant mammal species (badger, otter, pine marten, Irish hare, Irish stoat, hedgehog, pygmy shrew or red squirrel) that may have been temporarily displaced owing to construction activity are expected to utilise the habitats within and adjacent to the Proposed development site within a short period of time.

During the operational phase, there may be some slight disturbance owing to noise and human activity arising from periodic maintenance; however, it is considered that the level of operational traffic, human presence and ongoing maintenance will not significantly exceed existing noise levels at the site, given the level of agricultural and other activity within/surrounding the site.

There is some potential for minor excavations associated with drainage, access track and cable maintenance; however, these will be small in scale and infrequent in comparison to the construction phase. Maintenance works on turbines will be carried out from the tracks and hardstands. Some erosion of soil will continue into the operation phase, however, as vegetation becomes established and equilibrium is achieved, erosion rates will reduce to pre-construction levels, lowering the risk of effects on species such as otter.

Operational phase effects which may arise as a result of potential disturbance/displacement impacts on non-volant mammals identified as IEFs (badger, otter, hedgehog, pygmy shrew, red squirrel, Irish hare, Irish stoat, pine marten), in the absence of mitigation, are assessed as **Long term, Slight to Imperceptible Negative** effects.

6.4.2.4 Bats

The primary impact to bats associated with the operational phase of the proposed development is considered to be injury/mortality caused by potential collision with operational turbine blades and/or barotrauma (damage to internal tissues caused by rapid changes in air pressure as a result of moving turbine blades) (Mathews *et al.*, 2016).

Habitat loss from the construction phase will continue through the initial stages of the operational phase thus operation of the proposed wind farm has potential to result in disturbance to foraging and commuting bats. However decreased connectivity to proposed turbine locations is considered desirable to reduce risk of injury and/or fatality as a result of collision with wind turbines and/or their blades.

The susceptibility of bat species likely to be at risk of impacts from wind turbines is partly associated with the likelihood of different species flying at rotor blade height. Bat activity at the site was considered variable with periods of moderate to high activity occurring for some species. Though there is little published evidence regarding bat fatalities at wind farms in an Irish context, species of bats which may be considered to be at greater risk include Leisler's bat which are relatively larger, higher flying and forage independently of linear habitat features such as treelines and hedgerows. O'Donnell Environmental have carried out an assessment of collision risk for relevant species recorded at the proposed site. The assessment adapts a collision risk scheme provided in SNH (2019) and NatureScot (2021) and the assessment is considered to represent the best available information for use in an Irish context. Species are categorised into 'Low', 'Medium', and 'High' risk based on flight characteristics and foraging behaviour as well as fatality rates in the UK, whilst relative abundance was determined according to a scheme for rarity of bat species in Wray *et al.,* 2010 using best available population data from recent Article 17 reports (NPWS, 2019). The estimation scheme is presented in **Table 6-25** below.

Table 6-25: Estimation of Irish bat species' population vulnerability to wind energy development

Relative Abundance	Collision-Risk		
	Low	Medium	High
Common (100,000 plus)			Common Pipistrelle Soprano Pipistrelle
Rarer (10,000 – 100,000)	Daubenton's Bat Brown Long-eared Bat Lesser Horse-shoe Bat		Leisler's Bat
Rarest (under 10,000)	Natterer's Bat Whiskered Bat		Nathusius Pipistrelle

Population vulnerability: yellow = low, orange = medium, red = high.

In determining the project specific potential risk to bats, NatureScot (2021) recommends a two-stage process as follows:

- Stage 1: Indicatively assess potential site risk based on consideration of habitat present and development related features (i.e. number of turbines, size of turbines and proximity to other wind farms).
- Stage 2: Overall assessment of risk for high collision-risk species, considering bat activity results and the relative vulnerability of species.

The second stage assesses risk for high-collision species (see Table 6-26) considering species vulnerability and results of bat activity.

In relation to stage one, a site risk of 'Moderate' was considered appropriate due to the presence of three suitable bat roosts in the locality of the proposed wind farm site and the site containing foraging habitat well-connected to suitable foraging habitat in the hinterland. In consideration of development-related features, the project is considered to be in the 'Medium' category considering 12 turbines proposed, with no other wind farms (greater than 1no. turbine) within 10km (one proposal in appeal at 8km distance). This category uses the number of turbines, turbine height and proximity to other wind developments as the descriptors to define project size. Although the height of the turbines (158m ground level to blade tip) indicates their classification as a 'Large' project, the number of turbines proposed (12) and proximity to other wind developments also requires consideration and as a result the category of 'Medium' was considered by assessors to be a more appropriate project size category. Based on the initial risk assessment the proposed project is considered to be 'Medium Risk' to bats and a site risk score of 3 is applicable.

In relation to stage two, 'high collision-risk' species are assessed with regards to their activity level within the site in each monitoring period and in doing so identifies projects of greatest concern in terms of collision risk. The 'high collision-risk' species are Leisler's bat, Common pipistrelle, Soprano pipistrelle and Nathusius' bat.

Leisler's bat is a common species in Ireland and is considered high-risk due to their foraging behaviour and flight characteristics. Their minimum population range in Ireland is estimated at between 63,000 to 113,000 and they were recorded across all seasons during activity surveys. In the context of the proposed wind farm, their activity levels are considered 'Low to Moderate' across the three survey seasons.

Common pipistrelle is another widespread species in Ireland and is considered high-risk due to their foraging behaviour and flight characteristics. This species was the most common across the site with their activity across the seasons ranging from 'Moderate' in spring to 'Moderate to High' in autumn. Although there were significant peaks in activity noted for this species, an average of 'Moderate to High' activity was considered appropriate.

Soprano pipistrelle were also considered a 'high collision risk' species due to their foraging ecology and flight characteristics. Activity levels for this species is considered to be 'Low' in spring and summer and 'Low to Moderate' in autumn.

The fourth 'high collision risk' species Nathusius' pipistrelle is a slightly less agile, albeit fast, flyer compared to other pipistrelle species. Like the other species considered, Nathusius' pipistrelle is of high collision risk due to their foraging behaviour and flight characteristics. This bat species was only recorded in autumn monitoring with low numbers of registrations, thus yielding a 'Low' activity category for autumn.

The table below gives the results of the assessment, with scoring being a product of multiplying site risk level and the activity category for high collision species. The overall assessment results are categorised as follows: Low (green): 0 – 4, Medium (amber): 5 – 12, High (red): 15 – 25 (see Table 6-26).

Table 6-26: Overall collision risk assessment of relevant (high-risk) bat species

	Species	Site Risk Level	Activity Category	Overall Assessment
Spring 2023	Leisler's Bat	3	Low to Moderate (2)	6
	Common Pipistrelle	3	Moderate (3)	9
	Soprano Pipistrelle	3	Low (1)	3
Summer 2023	Leisler's Bat	3	Low to Moderate (2)	6
	Common Pipistrelle	3	Moderate (3)	9
	Soprano Pipistrelle	3	Low (1)	3
Autumn 2023	Leisler's Bat	3	Low to Moderate (2)	6
	Common Pipistrelle	3	Moderate to High (4)	12
	Soprano Pipistrelle	3	Low to Moderate (2)	6
	Nathusius' Pipistrelle	3	Low (1)	3

Overall collision risk assessment: Low (green), medium (amber), high (red) (following NatureScot, 2019).

The overall risk assessment pertains to high-risk species, and per NatureScot (2021), there is no requirement to assess for low-risk species. Low-risk species recorded at site include Brown Long-eared bat, Natterer's bat, Whiskered bat, Daubenton's bat, and Lesser Horseshoe bat. Overall activity levels for these species were 'Low' or 'Low to Moderate' and no significant related risk is likely in consideration of their low potential vulnerability to collision from wind energy developments.

The effect of potential impacts to bats during the operational phase of the proposed wind farm development is considered to be slight negative at a local level. For more details refer to **Appendix 6A.** The results of the assessment of operational effects are detailed in the table below (see **Table 6-27**).

Table 6-27: Operational stage potential effects on Important Ecological Feature bat species without mitigation

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (NRA 2009 & EPA 2022)
Common pipistrelle **Soprano pipistrelle**	Injury/mortality due to collision/barotrauma associated with rotating turbine blades.	Injury/mortality due to collision/barotrauma during the operational phase is assessed as **long-term, slight negative effects**.
Leisler's bat **Nathusius' bat**	Disturbance/displacement of foraging/commuting bats due to loss of relevant habitat, increased lighting.	Disturbance/displacement during the operational phase is assessed as **long-term, slight negative effects.**
Lesser Horseshoe bat **Daubenton's bat** **Brown long-eared bat**	In consideration of these species' flight characteristics and foraging behaviour, they are considered to be at low risk of injury/mortaility due to collision with turbine and/or its blades.	Injury/mortality due to collision/barotrauma during the operational phase is assessed as **long-term, insignificant negative effects**.

Whiskered bat ***Myotis* spp.**	Disturbance/displacement of foraging/commuting bats due to loss of relevant habitat, increased lighting.	Disturbance/displacement during the operational phase is assessed as **long-term, slight negative effects.**

6.4.2.5 Terrestrial Macro-Invertebrates

Within the proposed development site, stands of the food plant of marsh fritillary, devil's bit scabious, were recorded close to the proposed location of T7. However, following the HCA survey that no good quality habitat' will be lost and the area near T7 was determined to be unsuitable for marsh fritillary. As per the survey criteria, it can be considered that any operational phase effects to Marsh Fritillary are largely negligible. Table 6-28 below contains the result of the assessment.

Table 6-28: Operational stage potential effects on Important Ecological Features (terrestrial macro-invertebrates) without mitigation

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
Marsh Fritillary	Displacement due to habitat disturbance Considering the main areas of optimal habitat have been avoided, once the construction phase of the proposed development has been completed, any Marsh Fritillary butterflies that may have been temporarily displaced owing to construction activity would utilise the habitats within and adjacent to the proposed development site within a short period of time.	Disturbance and/or displacement effects on Marsh Fritillary during the operational phase are assessed as **Long-term, Insignificant Negative Effect.**
Other terrestrial macroinvertebrates	Displacement due to habitat disturbance Once the construction phase has been completed, other terrestrial macroinvertebrates initially displaced by construction would utilise the habitats within and adjacent to the proposed development site within a short period of time.	Disturbance and/or displacement effects on other terrestrial macroinvertebrates during the operational phase are assessed as **Long-term, Insignificant Negative Effect.**

6.4.2.6 Freshwater Aquatic Species

It is expected that any freshwater aquatic species that may have been temporarily affected due to construction activity would utilise the aquatic habitats downstream of the Proposed development site within a short period of time. The result of the assessment of operational effects are detailed in Table 6-29 below.

Table 6-29: Operational stage potential effects on Important Ecological Feature (freshwater fish and aquatic invertebrate species) without mitigation

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
Atlantic Salmon **River Lamprey** **Brook lamprey** **Other fish species**	Disturbance Once the construction phase is completed the source element of the source – pathway – receptor pathway will be significantly reduced. There is some potential for minor excavations associated with drainage, access track and	Disturbance and/or displacement effects on fish species during the operational phase are assessed as **Long-term, insignificant negative Effect.**

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
	cable maintenance, however these will be small in scale and infrequent in comparison to the construction phase. Maintenance works on turbines will be carried out from the tracks and hardstands. Some erosion of soil will continue into the initial operation phase, however, as vegetation becomes established and equilibrium is achieved, erosion rates will reduce to pre-construction levels, with the risk of water quality impacts and related effects returning to pre-construction conditions.	
Aquatic Macro-invertebrates (excluding FWPM and white-clawed crayfish)	<u>Disturbance</u> The majority of species recorded on site during aquatic surveying were pollution tolerant with low diversity recorded between aquatic macroinvertebrate communities. This is considered to be associated with the current fluvial condition of the on-site waterbodies, some of which are degraded from anthropogenic pressures such as agriculture. Once the construction phase is completed the source element of the source – pathway – receptor pathway will be significantly reduced. There is some potential for minor excavations associated with drainage, access track and cable maintenance, however these will be small in scale and infrequent in comparison to the construction phase. Maintenance works on turbines will be carried out from the tracks and hardstands. Some erosion of soil will continue into the operation phase, however, as vegetation becomes established and equilibrium is achieved, erosion rates will reduce to pre-construction levels, with the risk of water quality impacts and related effects returning with pre-construction conditions.	Disturbance and/or displacement effects on aquatic macroinvertebrates during the operational phase are assessed as **Long-term, Neutral Effect.**

6.4.2.7 Reptiles & Amphibians

Though common frog (*Rana temporaria*) utilises the site for breeding and foraging, it is expected that any frogs that may have been temporarily affected due to construction activity would utilise the aquatic habitats within and downstream of the Proposed development site within a short period of time. The table below (**Table 6-30**) details the results of the assessment for operational effects to common frog.

Table 6-30: Operational stage potential effects on Important Ecological Feature (common frog) without mitigation

Important Ecological Feature	Description of Unmitigated Impact	Significance of Unmitigated Effects (EPA 2022)
Common Frog	Disturbance Once the construction phase of the Proposed development has been completed, any individual frogs that may have been temporarily displaced owing to construction activity would utilise the habitats within and adjacent to the Proposed development site within a short period of time.	Disturbance and/or displacement effects on Common Frog during the operational phase are assessed as **Long-term, Neutral Effect.**

6.4.2.8 Water Quality

Macroinvertebrate sampling within streams currently draining the Proposed development area were composed of mostly pollution tolerant species with low diversity and as such the streams were rated as marginal-suboptimal. These conditions were associated with watercourse conditions/habitat suitability with degradation being considered to occur as a result of agricultural practices in the area.

The operational phase does not pose potential significant effects to water quality directly, however indirect effects may arise as a result of the operational phase which may affect water quality. In general, drainage and changes to morphology could comprise a potential concern to water quality during the operational phase of a wind farm development in the absence of appropriate design and mitigation. Consequently, any impact likely to occur as a result of the operational phase to water quality is assessed as being **likely short-term**, **slight negative** effect at a local level. However, the site drainage system was designed integrally with the wind farm infrastructure layout as a measure to ensure that the proposal will not change the existing flow regime across the site, will not deteriorate water quality and furthermore safeguard existing water quality status of the catchments from potential wind farm related sediment runoff.

6.4.3 Decommissioning Phase

At the end of the estimated 35-year lifespan of the Proposed development, the Developer will make the decision whether to repower or decommission the turbines. Any further proposals for development at the site during or after this time will be subject to a new planning permission application. If planning permission is not sought after the end of life of the turbines, the site will be decommissioned and partially reinstated with all 12 No. wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner and regulatory requirements and best practice applicable at the time. The information below outlines the likely decommissioning tasks based on current requirements and best practice.

Prior to wind turbine removal, due consideration would be given to any potential impacts arising from these operations. Some of the aspects to be considered and agreed with the Local Authority prior to decommissioning may include:

- Potential disturbance by the presence of cranes, heavy goods vehicles and personnel on-site.
- On-site temporary compound would need to be located appropriately.
- Time of year and timescale (to be outside sensitive periods).

- Prior to the decommissioning work, a comprehensive plan will be drawn up to ensure the safety of the public and workforce and the use of best available techniques at the time.
- Prior to the decommissioning work, a comprehensive reinstatement proposal, including the implementation of a programme that details the removal of structures and landscaping, will be submitted to the Planning Authority.

Any disturbance associated with the removal and disposal of the material may likely be more deleterious than leaving them in place. In the event of decommissioning being progressed, full engagement with the Local Authority and relevant departments including planning, environment and roads would take place to agree and ensure that any potential effects are minimised and controlled. A decommissioning plan would be agreed, and this would guide the process and control any potential effects.

Overall, the impacts of decommissioning a wind farm are potentially similar to construction impacts and will comprise temporary disturbance such as noise associated with decommissioning of turbines and on-site machinery. Ecological impacts of the decommissioning phase are assessed as **likely, temporary, moderate negative** effects.

6.4.4 Cumulative Effects

A cumulative effect arises from incremental changes caused by other past, present, or reasonably foreseeable activities interacting synergistically with the impacts generated by the proposed wind farm development in a manner that has the potential to cause effects on the receiving environment. The activities, pressures and projects identified as plausible sources of impacts to be assessed for their potential to generate cumulative effects are listed in the table below (**Table 6-31**), as are the characterisations of cumulative effects. The assessment and rationales supporting the individual characterisations are provided in **Sections 6.4.4.1** to **6.4.4.7**, inclusive, below. In each case the Confidence Level of the Prediction is Near certain.

With regard to the activities, pressures and projects that are germane, what is to be determined is if any such impacts are likely and, if so, if they are of a magnitude, character or duration sufficient to have an inherent/intrinsic capacity to cause cumulative effects through synergistic interaction with the Proposed development.

Table 6-31: Characterisation of Cumulative Effects for Proposed Ballycar Wind Farm

Other Activities	Characterisation of Effect			Confidence level
	Quality	Significance	Duration	
Climate change	Neutral	Imperceptible	Long term	Near certain
Agriculture	Negative	Significant	Short term	Near certain
Peat Extraction	Neutral	Imperceptible	Short term	Near certain
Forestry	Negative	Slight	Short term	Near certain
Quarry Extraction	Neutral	Not significant	Long-term	Near certain
Wind Farm Development	Neutral	Imperceptible	Long-term	Near certain
Plans (minor)	Neutral	Imperceptible	Long-term	Near certain

6.4.4.1 Minor Developments

A search of Clare County Council's on-line planning enquiry system was carried out to identify any plans or projects that could potentially interact with the proposed works to result in cumulative effects. With regard to the potential for significant in-combination effects due to interaction between the Proposed development and the

Clare County Development Plan (2023 – 2029), the CDP was considered regarding potential effects arising which may occur in-combination with the proposed wind farm development.

In general, County Development Plans incorporate a range of environmental and natural heritage policy safeguards. These safeguards to protect the natural environment will also apply to the proposal described in this report. No significant cumulative effects are predicted between the proposal and the Clare County Development Plan (2023 – 2029).

With regard to other projects and activities, it is considered that agriculture, forestry, on-going and future potential quarrying operations and to a lesser extent one-off rural residential developments comprise the projects and activities which could potentially interact synergistically with the Proposed development to result in significant cumulative or in-combination effects.

The Proposed development location is subject to ongoing industrial and residential development the most significant of which, in the immediate vicinity, are detailed in **Chapter 2 Description of the Proposed development** of this **EIAR**.

6.4.4.2 Climate Change

Climate is an important environmental influence on ecosystems. Changing climate affects ecosystems in a variety of ways. For instance, warming may force species to migrate to higher latitudes or higher elevations where temperatures are more conducive to their survival. Similarly, as sea level rises, saltwater intrusion into a freshwater system may displace species or cause mortality, thus removing predators or prey that are critical in the existing food chain. Climate change not only affects ecosystems and species directly, it also interacts with other human stressors such as development. Although some stressors cause only minor impacts when acting alone, their cumulative impact may lead to dramatic ecological changes (Settele *et al*, 2014). Because species differ in their ability to adjust, asynchronies[39] can develop, increasing species and ecosystem vulnerability. These asynchronies can include mismatches in the timing of migration, breeding, pest avoidance, and food availability. Growth and survival are reduced when migrants arrive at a location before or after food sources are present (Horton *et al.* 2014).

Ecosystems can serve as natural buffers from extreme events such as wildfires, flooding, and drought. Climate change and human modification may restrict ecosystems' ability to temper the impacts of extreme conditions, and thus may increase vulnerability to damage. An example of a biotope is the riparian zone that acts as buffer zones protecting riverine ecosystems from runoff of silt/nutrient laden waters via overland/pluvial flow, by absorbing/attenuating surface floodwaters. Land along the river watercourses may become vulnerable to erosion if climate change leads to increases in heavy rain-storms. This could lead to uncontrolled erosion of riverbanks, and riparian areas and loss of soil from fields, resulting in unnatural sediment loads and associated siltation of rivers. Climate change and shifts in ecological conditions could also support the spread of pathogens, parasites, diseases and non-native biota, with potentially serious effects on agriculture and aquatic ecosystems. Together with the proposed development, the aforementioned effects of climate change could exacerbate potential impacts associated with the proposed development.

Taking into account the degraded nature of the wider study area (existing water quality impacts, past and present forestry operations, extensive drainage in the limited peat areas), the potential for cumulative effects are considered unlikely to be significant, and **likely, long term, imperceptible, negative** at most.

The wind farm will reduce the need for fossil fuels to generate electricity so will have a positive impact by reducing CO_2 emissions. In this regard, the long-term effect is assessed as **certain, long-term, significant positive, cumulative** effect.

[39] absence or lack of concurrence in time

6.4.4.3 Forestry

Poorly managed and inappropriately sited forest operations can negatively impact on water quality and aquatic habitats and species. The most common water quality problems arising from forestry relate to the release of sediment and nutrients and the impacts from acidification. Forestry may also give rise to changes in stream flow regimes caused by associated land drainage[40]. Forestry has been identified as a significant pressure in 7 river water bodies in the Shannon Estuary North Catchment and in 3 water bodies in the Lower Shannon Catchment (EPA, 2018a; EPA, 2018b). The significant issues are a combination of general forestry pressures such as acidification, drainage, road construction, planting, and clear-felling. These pressures have resulted in nutrient loss, morphological changes, and organic pollution. The Proposed development will involve the construction of some new access tracks and other earthworks that can mobilise silt and nutrients. A proportion of the Proposed development occurs in and adjacent to conifer plantation.

Forestry is one of the main land uses within the proposed site and the greater area. The conifer plantation is the most dominant habitat within the proposed site boundary. The plantation consists mainly of mature sitka spruce. One of the impacts of this on the local environment is habitat loss, habitat alteration and potential reduction in water quality. Historically, it can be assumed that the forestry in the wider area has resulted in a loss of both upland blanket bog and other peatland habitats such as wet heath. This will have eliminated and/or reduced the habitat available for most native fauna and flora species. Continuing felling of forestry in the catchments containing the proposed wind farm, as observed in 2023 by tree harvesters, heavy tracked machinery, result in denudation of vegetation, exposure and loss of soil to watercourses via overland flow. This has negative consequences for aquatic ecosystems fed by waters from these areas, as outlined in the aquatic report.

There is potential for the Proposed development to contribute to a cumulative effect on water quality in local watercourses without the implementation of appropriate mitigations, within and downstream of the site, through the potential for sediments and other pollutants entering the watercourses, as a result of felling, in order to accommodate new access tracks and construction activities in addition to ongoing forestry operations. The Proposed development is assessed as potentially having a **likely, short-term, slight negative** cumulative effect on water quality in relation to forestry, without the implementation of appropriate mitigation measures. This effect however will be reduced as the forestry felled in 2023 will have started to be recolonised by local flora by the time the proposed development will be constructed, thus stabilising soils and limiting sediment / nutrient loss.

6.4.4.4 Agriculture

In the Shannon (Lower) sub catchment and the Owenogarney sub catchment agriculture was identified as the likely significant pressure for the 'At Risk' water bodies. Agriculture in both these sub catchments can produce elevated levels of sediment as well as diffuse phosphorus entering freshwater waterbodies.

Excess phosphorus is a key concern in freshwaters and in some of our estuaries. Diffuse phosphorus losses from agriculture are particularly difficult to manage as the sources do not occur uniformly in the landscape, but from 'hot spots', or critical source areas where runoff pathways connect phosphorus sources to rivers and streams. It takes only very small amounts of phosphorus to be lost, relative to the amounts used in agriculture, to cause a water quality problem. Cattle in the area may use watercourses as a source of water for drinking or as a crossing point during low flows. Unrestricted access of cattle to watercourses can potentially result in increases in the levels of organic nutrients found in surface waters and can alter habitats as a result of access and impact water quality by way of faecal contamination.

The Proposed development is assessed as having **likely, short-term, significant negative cumulative** effect on water quality in combination with the surrounding agriculture in the environs, without mitigation measures. In

[40] https://www.catchments.ie/significant-pressures-forestry/

the absence of suitable mitigation measures with regards to protection of water quality during the lifetime of the project, but in particular during the construction phase, there is potential for significant cumulative water quality effects as a result of the proposal in-combination with agricultural activity in the surrounding area. However, the implementation of water quality mitigation measures and other measures designed to protect woodland and riverine habitats as detailed in the biodiversity enhancement management plan will prevent significant effects arising as a result of the proposal and therefore, significant cumulative effects in-combination with agriculture are not likely to occur. The Biodiversity Enhancement Management Plan is detailed in **Appendix 6E** outlining enhancement measures for various habitats and species within the study area, which will reduce effects from agricultural activities within the site boundary on water quality throughout the operational lifetime (35 years) of the proposed development.

6.4.4.5 Peat Extraction

No peat was mapped on GSI maps for the Proposed development site whilst a site walkover identified a small area of degraded peaty type overburden in the north-western corner of the site. The extent was determined via depth probing. When designing the layout for the wind farm, this area was completely avoided.

Coordination of information on the environment (CORINE) Land Cover data of the area identifies an area of peat bog approximately 1km west of the Proposed development site. Watercourses flow into areas categorised as forestry and pasture before flowing to the Crompaun East River. However, this area is part of the Woodcock Hill Bog NHA (Site code: 002402) and is not an active site for extraction. Consequently, there is no significant cumulative effects likely to occur from peat extraction and the Proposed development. The effect is considered **likely, negligible, imperceptible, neutral, cumulative** effect.

6.4.4.6 Quarrying

O'Connell's Quarry is an active site quarrying shale/slate (greywacke) at Ballycar, just northeast of the Proposed development area; approximately 400m northeast of the nearest point of the site.

O'Connell's Quarry have lodged several planning permissions for expansion of the southern flank of their quarry, which borders the northern perimeter of the Proposed development site. Any works that are to commence are to be confined within the quarry and shall not expand into the Proposed development's area. Mining activities, namely blasting, quarrying, excavation works, and processing will occur within the quarry during the construction and operational phases of the Proposed development. During the construction process of turbine foundations, blasting may be necessary if rockhead is less than 3m depth.

There is potential for the Proposed development to contribute to a cumulative effect to noise through combined noise emissions from quarry blasting and blasting during the construction phase of the project, without implementation of mitigation measures. This disturbance could cause local disturbance to species in the audible range of the blast. Blasting is assessed as potentially having a **likely, not significant, negative, short-term, cumulative** effect on biodiversity in relation to the existing quarrying.

6.4.4.7 Other Wind Farm Development

Few wind energy developments have taken place or are within the planning system in the area surrounding the Proposed development. There is no potential for cumulative indirect water quality effects arising in combination with other wind energy projects in the same surface water catchment as the Proposed development. One single turbine is located in Knockballynameath, Parteen, Co. Clare, approximately 3.2km southeast of the proposed development area. Conditional permission was granted in 2010 to erect a single 800kW wind turbine, 73 meters high with a rotor diameter of 53 meters, and with ancillary road access (ABP planning ref: 314887). At the time of

writing, this turbine was granted permission for retention by Clare County Council. Another single turbine is located at Vistakon, 8.2km southeast of the proposed development site.

Other wind turbine developments identified within 25km of the proposed Ballycar development, along with their respective operational status, are listed below:

- Castlewaller (permitted – not constructed) (ABP planning ref: 304496);
- Carrownagowan (permitted – not constructed) (ABP planning ref: 317227).

The Carrownagowan Wind Farm will require a connection to Ardnacrusha, which will largely take place along the public road network and will not require instream works. Ecological documentation in support of this application was being prepared by MWP and has been submitted at time of writing. An application for the construction and operation of an 8-turbine wind farm at Fahy Beg, located approximately 8.5km northeast of the proposed development site was submitted in January 2022, however this application was 'Invalidated' on 16th February 2022 due to an incomplete application, resubmitted and consequently refused by Clare County Council. It is currently with An Bord Pleanála undergoing an appeals process.

As the closest permitted but not yet constructed wind farm of scale (Carrownagowan) to Ballycar is located approximately 12km to the northeast, wind farm development is not considered to have the potential to act in combination with the proposed wind farm development at Ballycar which will lead to significant effects to biodiversity. Furthermore, due to the distances that intervene between the proposed development at Ballycar and any other wind farms (permitted, proposed or operational, including Fahy Beg should it ultimately be approved) in the area, there is no plausible potential for significant cumulative effects to biodiversity to arise. This takes account of grid connections to Ardnacrusha. Consequently, the effect is considered to be a **long-term, imperceptible, negative cumulative** effect.

6.5 Mitigation and Monitoring Measures

6.5.1 Mitigation by Design (Avoidance)

Site design was carried out with cognisance to ecological features to minimise the impact of the Proposed development on Biodiversity. Consultation between the design team (Project Manager, Project Engineers, and Project Ecologists) and the developer was conducted on an ongoing basis during the design phase, in order to formulate a project design which would avoid, prevent and/or minimise any significant adverse ecological effects, in so much as was practicably possible. A considerable effort was spent by the project ecologists and engineers on avoiding or minimising ecological effects and this has been constraint led throughout the design process.

The project has been designed to minimise the footprint of the Proposed development on more ecologically sensitive habitats. This has been achieved in collaboration with engineering constraints, for example by taking account of peat location, habitat value and areas potentially impacted. The project design has followed the basic principles outlined below to reduce/eliminate the potential for significant effects on ecological receptors:

- Intensive site investigations were undertaken to ascertain a detailed understanding of the site's peat profile to inform the optimum wind farm design by avoiding peat areas.
- A detailed habitat constraints map was generated to minimise habitat loss (e.g. hardstanding areas designed to the minimum size necessary), ensuring avoidance of ecologically-sensitive habitats such as peatlands (e.g. re-locating of T1 further north-eastwards to avoid an area of wet heath/upland blanket bog in the north-west of the site, the placement of minimal infrastructure on other sensitive habitats (e.g. re-locating T12 to avoid loss of broadleaved woodland) and the placement of maximum infrastructure in conifer plantation, farmland and other ecologically lower-value habitats.

- This has resulted in proposed infrastructure being primarily sited in conifer plantation and agricultural grassland, using existing access tracks wherever possible.
- Hydrological buffers were applied.
- The proposed project has avoided the requirement for any in-stream works.
- Avoidance of wildlife refuge sites (e.g., waterbodies) insofar as possible.
- The grid connection route and internal access tracks were selected to utilise existing built infrastructure for the majority of their lengths (i.e., cables to be laid within existing tracks).
- Cables will be laid underground to minimise effects on hedgerows and disturbance to fauna.

6.5.2 Mitigation by Management

6.5.2.1 Construction Phase

Project Ecologist/Ecological Clerk of Works (ECoW)

A suitable qualified and experienced Project Ecologist/ECoW will be employed during the construction phase of the project. Duties will include the review of all method statements, delivery of toolbox talks, undertaking of all required pre-construction surveys for protected species, clearance works, and monitoring of works throughout the construction phase to ensure all environmental controls and EIAR mitigation is implemented in full. As part of toolbox talks, contractor staff and other site personnel, as relevant, will be made aware of the procedure to follow if a protected species or their resting or breeding site, is encountered.

The Project Ecologist/ECoW will be awarded a level of authority and will be allowed to stop construction activity if there is potential for adverse environmental effects other than those predicted and mitigated for in the EIAR. The project ecologist/ECoW will be responsible for pointing out boundaries of exclusion zones as per below.

The appointed Project Ecologist/ECoW will have demonstrated professional experience in managing large-scale construction works affecting ecological receptors identified within the EIAR.

Construction and Environmental Management Plan (CEMP)

A CEMP has been prepared for the proposed project. The CEMP will be finalised and implemented by the appointed contractor. The implementation of the mitigation measures and environmental commitments of the project, as well as the monitoring and supervision of these measures, and follow-up arrangements and management of any potential effects, will be managed through the CEMP. Mitigation measures to prevent likely significant negative effects to the ecological receptors identified in this chapter and Chapter 8 Water will also be incorporated into the project through the CEMP and will be overseen by the Project Ecologist/ECoW. Mitigation measures will be monitored for compliance in-line with the requirements of the Planning Consent.

As recommended in Nature Scot (2019), drainage through or under floating tracks will be maintained to prevent the structure acting as a dam, impounding water on the uphill side and causing drought on the downhill side. Regular maintenance inspections will be required to monitor the operation of such drainage. Construction of the tracks will allow for continued drainage across the line of the track even under compaction and settlement. This will be achieved through the sub-base (by using coarse granular material) or by constructing drains at regular points along the length of the track (SNH, 2015).

The finalised CEMP will take cognisance of Construction Industry Research and Information Association (CIRIA) technical guidance on water pollution control (Masters-Williams et al., 2001; Murnane et al, 2006; Audus et al., 2010) and will include, but is not limited to, the following construction phase elements:

- Management of Excavations;
- Surface Water Management Plan (Sediment and Erosion Control);

- Fuels and Oils Management;
- Management of Concrete;
- Construction Waste and By-product Management Plan;
- Wheel Wash Management Procedure;
- Construction Dust Management;
- Construction Noise Management;
- Biodiversity Enhancement Management Plan;
- Management of Invasive Species;
- Monitoring and Auditing Procedures;
- Environmental Accidents, Incidents and Corrective Actions.

Construction method statements will be prepared prior to commencement of construction and incorporated into the CEMP.

Site Environmental Manager

Routine inspections of construction activity will be carried out on a daily basis by the Site Environmental Manager and/or appointed contractor staff to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place. Environmental inspections will ensure that the works are undertaken in compliance with the CEMP and that the requirements of the Conditions of Planning and associated documentation are being adhered to during construction. Only suitably trained staff will undertake environmental site inspections.

Habitats

General Protection of Habitats

The area of proposed works will be kept to the minimum necessary to minimise disturbance to habitats and flora. The footprint of the development area and construction area will be clearly marked prior to commencement of construction with secure posts and high visibility tape. These areas will be marked out with reference to design drawings, under the supervision of the project engineer and Project Ecologist. There will be no removal of habitat, movement/storage of construction machinery or any other construction related activities permitted outside the Proposed development area.

Habitat disturbance will be limited by controlling the movement of plant, machinery and personnel.

Regarding tree, hedgerow and scrub habitats, including mature trees within linear habitat features, within the site that are not proposed to be removed as part of the works, these will be retained, and all possible measures will be taken to protect vegetation and/or the habitat feature from damage or disturbance. Such impacts may arise from physical damage to individual trees and shrubs, damage/alteration of the surrounding ground such as compaction of soil and/or changes in ground levels due to excavation. Any works in proximity of these areas will be undertaken in line with the advice of the Project Ecologist/ECoW and with regard to 'Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub, Prior, During and Post Construction of National Road Schemes' (NRA, 2006).

Exclusion Zones

Areas of ecologically sensitive habitat will be marked by secure posts and robust high visibility tape under the supervision of the Project Ecologist/ECoW and with reference to planning drawings. This will ensure that sensitive

areas of the site and wider area, identified during the ecological constraints study, are excluded from any works activity or disturbance. Machinery will not be permitted to breach these exclusion zones, and there shall be no side casting of material or any other construction-related activity within these areas.

For example, the area of wet heath/upland blanket bog located in the north-west of the site, although currently degraded to some extent, was constrained out of the potential developable area during constraints analysis. This area will be encompassed within an exclusion zone to reduce any potential impacts.

Removal of Vegetation (excluding conifer plantation)

In accordance with Section 40 of the Wildlife Acts, vegetation removal, including hedgerow and tree removal, will be conducted outside of the restricted bird nesting period (March 1st to 31st August). The provisions of Section 40 of the Acts do not relate exclusively to birds, but considers the enhancement of interests of biodiversity, the protection of which will contribute to local food chains and ecosystem functioning.

Forestry Felling

Overall, felling of appropriately 15.97 ha of commercial forestry will be required.

All tree felling will be undertaken in accordance with the conditions attached to the tree felling licence and in accordance with Forest Service Guidelines.

Hedgerow and Treeline Reinstatement

Where hedgerow and treeline removal are required within the proposed development site, these areas of loss will be fully reinstated within the proposed wind farm site with native hedgerow and tree species. Appropriate planting of native trees and shrubs will be carried out along suitable stretches of the access tracks. Planting will comprise a mix of semi-mature specimen trees, immature trees and pollinator-friendly hedgerow species. Planting of species will be staggered to achieve structural heterogeneity, avoid excessive shading and promote natural diversity as the field and shrub layers establish over-time. Fast-growing species such as willow (*Salix* spp.) and alder (*Alnus glutinosa*) will be used, along with other native hedgerow species such as whitethorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*), holly (*Ilex aquifolium*), rowan (*Sorbus aucuparia*), bramble (*Rubus fruticosus*), birch (*Betula* spp.) and hazel (*Corylus avellana*).

Reinstatement will ensure that there will be no net loss of these habitats. Please refer to the Biodiversity Enhancement Management Plan (Appendix 6E) for details of the reinstatement of hedgerow and treeline habitats.

Woodland/Scrub Habitat Reinstatement

Where there will be unavoidable removal of areas of semi-natural woodland as well as scrub, these areas of loss will be fully reinstated within the site with native tree and shrub species of a similar composition to affected areas.

The Project Ecologist will advise on the appropriate species and planting requirements to be implemented in line with the species composition of the existing semi-natural habitats in the area.

Any reinstated vegetation will be monitored by the Project Ecologist. Spraying of vegetation using pesticides (herbicides, fungicides and insecticides) will not be permitted at any stage of development. Refer to the Biodiversity Enhancement Management Plan for areas for reinstatement of woodland/scrub habitats.

Regarding removal of semi-natural grassland habitats, topsoil will be retained for use during reinstatement. A layer of topsoil will be spread evenly, as required, over the affected area under the supervision of the Project Ecologist. These areas shall then be temporarily fenced off and allowed to regenerate naturally. No fertiliser or herbicide shall be applied. These areas shall be monitored by the Project Ecologist for potential encroachment of invasive species. Where vegetation is slow to regenerate naturally, planting of native plant species will be undertaken. The Project Ecologist will advise on the use of appropriate species and planting requirements in line with the species composition of the existing semi-natural habitats in the area.

Habitat reinstatement will commence at construction stage. The success of any habitat reinstatement measures will be monitored by the Project Ecologist throughout the construction phase and continue into the operational phase.

Where habitat reinstatement measures are successfully implemented, monitoring of habitats can cease, as directed by the Project Ecologist. Where required, periodic management measures (e.g., checking of drains, removal of invasive species) will be implemented. Where required, alteration and/or additional enhancement measures will be implemented. This will be overseen by the Project Ecologist and monitored on an on-going basis.

Further details on habitat management and reinstatement measures to be undertaken are included in **Appendix 6E**.

Protection of Fauna

Badger and Otter

A number of badger setts were identified during baseline ecology surveys, at least one of which was confirmed active at the time of surveys. These setts will be retained. None of the identified setts are within 30 m or 50 m of a proposed turbine location or access track; however, badgers move between setts and can excavate new setts.

No otter holts were identified, and no evidence of otter was found during the baseline ecology surveys.

Pre-construction surveys for non-volant mammals, such as badger and otter, will be undertaken prior to the commencement of any construction activity to identify any changes within the site with regard to protected mammals. The pre-construction surveys will be undertaken no more than 10-12 months in advance of construction. The surveys will be supplemented by an additional survey immediately prior to site works commencing.

Where areas of dense vegetation are to be removed, the Project Ecologist/ECoW will be present to oversee removal of vegetation and ensure any necessary mitigation measures are in place in the event that a previously unknown breeding or resting site of any protected mammal species e.g., badger sett, are encountered during the works.

If any new badger setts are discovered during the pre-construction surveys within or in proximity to the construction corridor, then all works within a 30 m buffer (50 m buffer during the breeding season) will cease. NPWS will be contacted, and the necessary mitigation implemented further to consultation.

Surveys and implementation of best-practice guidelines for badger and otter will be overseen by the Project Ecologist/ECoW and in accordance with NRA/TII Guidelines 'Guidelines for the Treatment of otters prior to the Construction of National Road Schemes' (NRA 2008) and 'Guidelines for the Treatment of badgers prior to the Construction of National Road Schemes' (NRA, 2008).

Where relevant, mitigation for badger and otter will be carried out in full accordance with NRA/TII Guidelines.

Red Squirrel, Pine Marten and Irish Stoat

Where possible, felling of forestry will be limited to periods outside of when red squirrel and pine marten are likely to have young in dreys/dens (peak period January to March for red squirrel, March and April for pine marten). If felling of forestry during these time periods is unavoidable, then the area to be cleared will be surveyed by a suitably-qualified ecologist to search for the presence of breeding sites. The general avoidance of removal of vegetation during the bird-nesting period (March to August, inclusive) will avoid disturbance to stoat during their peak breeding season.

Where any breeding sites will be disturbed, mitigation will be carried out under approval from NPWS as necessary and in full accordance with NRA/TII Guidelines.

Irish hare, Hedgehog and Pygmy Shrew

These species are mobile and so are expected to disperse from the area; however, young are vulnerable to impacts during vegetation clearance and/or during periods of hibernation, in the case of hedgehog. Prior to any vegetation clearance, the area to be cleared will be checked by a suitably-qualified ecologist to check for the presence of young mammals, or hibernating hedgehog, as appropriate.

Bats - Pre-construction Surveys

Of the 94 trees identified and assessed within the proposed wind farm site and along the TDR as it approaches the site entrance only 3 were rated as having moderate suitability (PRF-M) and 31 trees were rated as having low suitability (PRF-I).

Enabling works along the TDR at the proposed site entrance at Node 13 (see Figure 3.4, Appendix 6A) will result in the removal of trees of low (PRF-I) suitability for bat roosting. Prior to the delivery of turbines, trees will be surveyed for roosting bats at height or by means of emergence survey in advance of works to determine if roosting occurs or is likely to occur. Surveys will be carried out according to Collins (2023). In the event that the removal of any trees with suitability for bat roosting is required, a derogation license will be secured in advance of any tree-felling works, and appropriate mitigation measures will be put in place to avoid or reduce impacts on bats.

The loss of two mature Beech trees at Node 11 (see Figure 3.4, Appendix 6A) with moderate (PRF-M) suitability has been 'designed-out' in consultation with O'Donnell Environmental Ecologists through the use of a 'blade adjuster', and these trees will now be retained.

Prior to the commencement of site clearance within the proposed wind farm development area, surveys will be carried out on trees identified as having PRF-I or PRF-M suitability for bat roosting. If roosts are found or are likely to be present, an appropriate mitigation strategy will be devised following Marnell (2022) and Collins (2023) and an application to NPWS for a derogation license under section 55 of S.I. No. 477 of 2011 (Birds and Natural Habitats Regulations) will be made.
A comprehensive survey effort was carried out in relation to potential roost features in structures following Collins (2023) and no evidence of roosting was found in relation to the three man-made structures within the wind farm site (see Figure 3.2 and 3.3 within Appendix 6A for structure locations). These structures are considered to have negligible potential to host a maternity roost for any bat species but may be used by individual bats or small numbers of bats at least occasionally. The structures are not proposed for removal as part of the current design and therefore further surveys or other mitigation are not considered warranted.

A derogation license is required where disturbance to a bat roost is likely to occur (Marnell et al., 2022). Based on current information, a derogation license issued under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 is not required to facilitate the proposed works.

Bat Activity Surveys

Pre-construction surveys will be carried out by an Ecologist prior to the commencement of vegetation clearance. The aim of this survey is to establish if the baseline conditions reported herein remain valid, given the potential for delays between reporting and the commencement of construction. In particular the status of important features such as significant PRFs will be confirmed, and ecological advice sought as required. An Ecologist will carry out pre-clearance inspections immediately in advance of tree-felling and vegetation removal. This will

ensure that any changes in site context in relation to suitability for bats will be highlighted and that any additional mitigation measures which are then required are applied.

Turbine Buffer Felling

Some sections of hedgerow (WL1) and mature treeline (WL2) habitat removal is required to accommodate the development of the new site access tracks and buffer areas for bats. Also, NatureScot (2021) recommends a minimum 50m buffer from the blade tip to the nearest key habitat features (e.g. woodland, hedgerow etc.) to be implemented to avoid encouraging bat activity within the 'blade-swept' area. These areas will be maintained vegetation-free during the operational life of the development. A methodology for determining the recommended clearance area at ground level is presented in NatureScot (2021).

To calculate the necessary buffer distance required between the edge of the woodland (feature) and the centre of the tower to achieve the 50m clearance setback, as above, the following formula (adapted from NatureScot, 2021) is used to calculate (D), the distance;

$$D = [(50 + bl)^2 - (hh - fh)^2]^{½}$$

Where: bl = blade length, hh = hub height, fh = feature height (all in metres).

The approximate average height (fh) of the vegetation surrounding each proposed turbine was measured and in the case of commercial forestry an average feature height at harvest of 20m was assumed. These values were inputted into a formula alongside the associated measurements of each turbine to determine turbine specific minimum clearance buffers. The output is summarized in Table 6.1, Appendix 6A shows the minimum vegetation clearance buffer surrounding each turbine ranging from 76m up to 95m.

Clearance of vegetation to a maximum of the clearance buffer distance will be carried out for all turbines up to the redline boundary, and these areas will be maintained free from woodland, hedgerows or treelines throughout the operational phase of the wind farm.

Control of regrowth of trees/encroachment of scrub will be managed and controlled within buffer areas for the lifetime of the wind farm to maintain vegetation at low-height, and thus retain clearance setbacks around relevant turbines. Vegetation will be managed by appropriate mechanical means. Chemical control will be prohibited.

Tree-felling

All tree-felling is to be conducted in a manner sensitive to bats, and in accordance with NRA (2005). Any ivy-covered trees which are felled will be left to lie for a minimum 24 hours after felling to allow any bats present to leave. Tree felling will be carried out in line with a felling licence where required.

Bat-boxes (Loss of potential roost-sites)

Where tree-felling of individual trees identified as having PDR-I or PRF-M will take place, suitable bat boxes will be erected prior to any tree felling to mitigate for loss of potential roost-sites. The number and type of bat boxes required will be determined by the species recorded and number of bats or roosts that are affected and/or the category and number of PRFs proposed to be felled.

Design and installation of the bat box scheme will be as per NRA (undated) and overseen by a bat specialist and/or the Project Ecologist/ECoW.

Lighting

Appropriate lighting will be employed during the construction and operational phases to minimise impacts on local bat populations. Use of lighting will be minimised and avoided, where possible. Construction lighting will be

targeted to minimise/avoid light spill to enable the retention of dark-corridor connectivity within the landscape for commuting bats.

Where lighting is required, the following will be considered:

- Lighting that meets the lowest light levels permitted under health and safety will be installed. Low-pressure sodium lights will be used instead of high-pressure sodium lights or mercury lamps. If mercury lamps are to be used, they will be fitted with UV filters.
- LED luminaires will also be used due to the fact that they are highly directional, lower intensity, good colour rendition and dimming capability.
- All lighting used will lack UV/IR elements to reduce impact.
- Directional lighting will be used to prevent overspill on to forestry/woodland edges, riparian zones or other habitat features of importance to bats. This will be achieved with the use of covers and shields (baffles, hoods or louvres) to reduce light spill and direct lighting to the intended area only.
- Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Only luminaires with an upward light ratio of 0% and with good optical control will be used.
- Luminaires will be mounted on the horizontal, i.e. no upward tilt.

Any external security lighting will be set on motion-sensors and short (1min) timers.

The use of 'white lights' on the turbines will not be permitted as these can attract insects, which in turn can attract bats (Bat Conservation Ireland, 2010).

Any lighting introduced to the proposed development site will follow guidance in the documents:

- Institution of Lighting Professionals (ILP) (2023). Guidance Note 08/18. Bats and Artificial Lighting in the UK - Bats and the Built Environment Series;
- Bats & Lighting. Guidance Notes for: Planners, engineers, architects and developers (BCI, 2010);
- Bat Mitigation Guidelines for Ireland Ver 2. *Irish Wildlife Manuals*, No 134 (Marnell *et al.,* 2022);
- Scottish Natural Heritage (SNH). Bats and onshore wind turbines – survey, assessment and mitigation (2021).

Amphibians

Amphibian surveys will be carried out by an ecologist in advance of construction works. These surveys will focus on breeding areas potentially used by amphibians. Methodology for frog surveys will follow Reis et al. (2013). In the event that there is a requirement to disturb breeding frogs, frog spawn and/or spawning habitat, appropriate actions will be followed by the project ecologist to ensure their preservation including seeking derogation licence where frogs will require translocations in order to proceed with proposed works. Translocation efforts include the capture and removal of frogs, frogspawn, and tadpoles from any affected habitat to the nearest available and suitable habitat. These efforts will be undertaken in advance of construction works commencing. Furthermore, habitats in the vicinity of T1, wherein frog spawning habitat was identified, will be enhanced with the creation of approximately 1.8ha of wet grassland area and approximately 2.1ha of wet heath/upland bog habitat. Additionally, the nearby Cappateemore East stream to the south east of T1 (*ca.* 130m of nearest frog spawning) and an unnamed tributary of the Glennagross stream to the west of T1 (*ca.* 330m), both 1st-order streams, offer suitable areas nearby for translocation efforts.

Frogs are relatively opportunistic in habitat choice and are likely to occupy silt ponds where they are created. These silt ponds are likely to support amphibian and macroinvertebrate biodiversity during operational phases and beyond where retained.

Marsh Fritillary

Suitable habitat for marsh fritillary, as per habitat criteria as set out by the NBDC as 'Good Condition Habitat', was identified within the study area, however outside the development area for the proposed Ballycar Windfarm and marsh fritillary were confirmed present in these areas (please see Appendix 6D). Areas of suitable marsh fritillary habitat identified within the study area will be marked and fenced off prior to the commencement of works. This will ensure no inadvertent loss or disturbance from machinery or storage of materials or equipment.

This species has a meta-population structure. The extent and magnitude of these populations is dependent on the suitability of habitat patches and the topography of the landscape. While the proposed development has avoided, as part of design, areas identified as good habitat for marsh fritillary, the remaining surveyed areas, determined to be 'Unsuitable Habitat' at the time of baseline surveys, have the potential to become more favourable for marsh fritillary should existing land management practices change in the intervening period between the baseline surveys and construction.

Given the presence of a confirmed population of marsh fritillary, outside but in close proximity to the proposed development site, on a precautionary basis, pre-construction larval web surveys for marsh fritillary will be undertaken in potentially suitable habitat by a suitably qualified ecologist, in line with NBDC guidance, prior to construction works commencing, in order to identify any areas additional to those mapped in the Marsh Fritillary Survey Report and appropriate mitigation measures will be taken. Mitigation measures for Marsh Fritillary include pre-construction surveys for marsh fritillary as well as the marking and fencing off of suitable marsh fritillary habitat prior to the commencement of works.

Where suitable marsh fritillary habitat occurs in close proximity to the proposed infrastructure, side casting of material will be to the opposite side of the proposed infrastructure to where the suitable habitat occurs. This will ensure that there is no potential for direct or indirect impacts on marsh fritillary habitat. This measure will also protect existing suitable habitat for other Lepidoptera/pollinator species of local importance.

General Protection of Fauna

The following general measures will be implemented during construction:

- Habitat disturbance to fauna will be limited by controlling the movement of plant, and vehicles. Construction vehicles will not encroach onto habitats beyond the proposed project footprint.
- Unless permitted by the planning authority the duration of construction activities will be restricted to between 7am and 7pm, Monday to Friday and between 7am and 2pm on Saturdays, but not during darkness, unless in exceptional circumstances to reduce potential disturbance to fauna.
- Should the resting or breeding place of any protected species be discovered within the site prior to or during construction works, any works in the vicinity will cease immediately, the area will be cordoned off and advice will be obtained from the Project Ecologist/ECoW and NPWS, where required. The Project Ecologist/ECoW will implement relevant mitigation and protection measures, as required (i.e. setting up an exclusion zone). Any additional site-specific mitigations deemed required by the Project Ecologist/ECoW will be prepared in agreement with NPWS. Such mitigations may include obtaining a derogation licence where protected species, frog for example, may require translocation.
- All construction activity and site works will be undertaken in accordance with relevant best-practice guidance.

Management and Treatment of Invasive Alien Species (IAS)

Species identified on-site include Japanese knotweed, Himalayan balsam and cherry laurel. An Invasive Species Management Plan (ISMP) has been developed (see **Appendix 6F**) and will be incorporated into the finalised Contractors CEMP. The project proponent will engage the services of an invasive plant species specialist to prepare and oversee the implementation of the Site-Specific Management Plan. The Management Plan will be in place for the duration of the construction phase of the proposed project.

The Management Plan describes the best practice measures that will be adhered to during the construction phase of the proposed project, including the installation of the grid connection, to manage and/or control IAS on-site, and will be in line with the National Roads Authority – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA, 2010). Best practice and mitigation will be incorporated into the project construction phase via the **CEMP** (See **EIAR Volume III**).

A pre-construction survey for invasive species will be conducted and will include the proposed wind farm site and the grid connection route. Should invasive species be recorded at works locations along the grid connection route or within the development footprint, other than those species/infestations already documented as part of baseline ecology surveys, the ISMP will be updated accordingly, prior to construction works commencing.

All areas where invasive species occur will be identified during the pre-construction surveys. All areas will be demarcated prior to commencement of construction.

Treatment and management of Japanese knotweed and Himalayan balsam on-site will follow Best Practice Management Guidelines produced by NRA (2010), and Invasive Species Ireland (Kelly et al., 2008a, and 2008b), as relevant.

Regarding post-construction stage monitoring and treatment. For more information, please see the ISMP for the Proposed development, which can be found in **Appendix 6F**, which details containment and eradication measures.

Biosecurity

Prior to being brought onto site, all plant, equipment and PPE will have to be clean and free of soil/mud/debris or any attached plant or animal material. Prior to entering the site, all plant and equipment will be thoroughly cleaned down using a power washer unit to prevent the spread of IAS. All plant/equipment will be visually inspected to ensure all adherent material and debris has been removed.

Prior to being brought to site, certification will be obtained from suppliers that all raw materials including soil, fill, sand, gravel and landscaping materials to be imported are free from IAS. Locations for supply e.g. quarries etc., will be assessed for the presence of IAS prior to materials being brought to site.

All footwear/waders and/or equipment that is to be used within the aquatic environment will be treated to prevent foreign flora/fauna entering the water, and again after use, to prevent spread to other catchments.

Non-native species control will be implemented and managed according to the following IFI document, noting that some works components are located at/near watercourses 'IFI Biosecurity Protocol for Field Survey Work' (IFI, 2010).

For more information, please see the ISMP for the proposed development, **Appendix 6F**, which outlines all mitigation measures in relation to biosecurity on-site.

Water Quality

The main potential for impacts is during the construction phase. Run-off of silt and pollution by accidental concrete/fuel/oil spill, will comprise the main sources of potential water quality impacts during the construction stage.

Construction phase mitigation for hydrology will follow that outlined in Chapter 8 Water.

A site-specific Surface Water Management Plan has been designed for the Proposed development to avoid/minimize impacts to water quality within and downstream of the site. Refer to Chapter 3 Civil Engineering for full details. In addition, the CEMP provides various management plans for the protection of water quality during the construction phase. The CEMP also provides for the appointment of a Site Environmental Manager who will be responsible for checking and monitoring construction works from an environmental perspective, including the protection of water quality in receiving watercourses.

A programme for water monitoring will be prepared in consultation with Inland Fisheries Ireland prior to the commencement of the construction of the wind farm. The plan will include monitoring of water during the pre-construction, throughout construction and in the immediate post construction phases.

Further baseline water quality monitoring of all streams near the development site will be undertaken prior to construction to confirm existing conditions at the time of construction. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible.

Silt control will be a primary concern during the construction stage, as silt has been identified as a sediment source to downstream areas. Silt ponds will be required mitigation at access tracks and swales within the Proposed development site as these are considered an effective method of retaining silt. The design of these features will be in accordance with best practice, oversized and retained post construction.

During the construction phase of the project, water quality in the streams and outflow from the drainage and attenuation system will be monitored, field-tested and laboratory tested on a regular basis during different weather conditions. This monitoring together with the visual monitoring will help to ensure that the mitigation measures that are in place to protect water quality are working effectively.

During the construction phase of the project, the development areas will be monitored regularly for evidence of groundwater seepage, water ponding and wetting of previously dry spots, and visual monitoring of the effectiveness of the constructed drainage and attenuation system to ensure it does not become blocked, eroded, or damaged during the construction process.

Prior to any construction activity being carried out, the subject part(s) of the Proposed development site will be inspected for areas that may be prone to siltation of nearby rivers/streams and drains as appropriate. Where necessary, check dams, sand-bags and/or silt fences will be installed in adjacent trackside drainage ditches to ensure an optimum standard of water running into adjacent streams from the trackside drainage. During periods of heavy precipitation and run-off, works will be halted if posing a risk to the water environment or working surfaces/pads will be provided to minimise soil disturbance. Any requirement for temporary fills or stockpiles will be covered with polyethylene sheeting of suitable grade/gauge to avoid sediment release during periods of heavy rainfall.

Additional infrastructure and measures used to control water quality will include:

- Settling out as far as reasonably practicable any silty water generated on site through drainage mitigation measures (silt traps, etc.) and channelled into suitable vegetation (as defined by ECoW) at least 50 m from watercourses;
- Establishing vegetation on exposed areas by using top sod or reseeding with a suitable seed mix;
- Regular road cleaning;

- Use of wheel washes;
- Use of check dams on drains to slow water velocity;
- Use of silt fences on drains to reduce sediment loading;
- Daily and weekly weather forecast monitoring; and
- Programme of daily, weekly, and monthly water quality monitoring.

All design and works in proximity to watercourses will follow the best practice guidance outlined in the following documents:

- Draft Revised Wind Energy Development Guidelines (DHPLG, 2019);
- 'Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters' (IFI, 2016);
- 'Control of water pollution from linear construction projects' (Murnane et al. 2006);
- 'Guidelines for the crossing of Watercourses during Construction of National Road Schemes' (NRA, 2008).

A site-specific Water Quality Management System has been designed for the proposed development to avoid and minimize impacts to water quality within the site (refer to Chapter 3 Civil Engineering).

Dewatering

All ground water/surface water that may enter turbine foundations or cable trenches/joint bays will be removed and treated and disposed of appropriately, in accordance with best practice. Any dewatering (if/where required) will adhere to the following measures:

- Ground water/surface water will not be pumped directly into trackside drains/watercourses;
- Ground water/surface water which has become silted within the turbine foundations will be pumped to the surface water drainage system to settle out; and
- Ground water/surface water which has become silted within the trenches/joint bays will be pumped and allowed to infiltrate to a designated percolation area (area designated by the ECoW). Dedicated settlement ponds will be provided adjacent to the site tracks, proposed borrow pit location, hard stands, substation. The design and locations of the ponds are outlined in Chapter 3 Civil Engineering. Where necessary, sediment ponds will be partly filled with stone so that they will not present a long-term safety risk. The remaining ponds will be left to fill in and re-vegetate naturally or retained as ponds.

Cement Bound Granular Mixtures (CBGM)

For the cable trench construction, temporary storage of cement bound granular mixture (CBGM) will be on hardstand areas, or areas that are not prone to run off. These areas will be located where there is no direct drainage to surface waters and where the area has been appropriately bunded. Bunding will be in the form of sandbags, geotextile sheeting, or silt fencing. This method will prevent any solid run-off. Concrete truck chutes will be washed out at a dedicated, bunded area.

Forestry Felling

Harvesting is the main of two forest operations that can cause nutrient run-off to water bodies and contribute to their eutrophication unless mitigating measures are taken. The *Forestry and Water Quality Guidelines* (DMNR, 2000) and *Standards for Felling & Reforestation* (DAFM, 2019) describe best practice that must be adopted if carrying out felling. A harvesting plan and associated mapping will be prepared and will include a review of the felling areas, environmental receptors – water features (including aquatic zones, relevant watercourses, hotspots, water abstraction points and crossing points), biodiversity (including hedgerows and other habitats), selection of felling and extraction system and machinery, silt and sediment control, timing, and extraction management.

Fuel Management

All plant will be refuelled on site e.g. excavators, dumpers etc, while rigid and articulated vehicles will be fuelled off site as will all site vehicles (jeeps, cars and vans). At construction stage, a Fuel Management Plan will be developed specific to the site and the particular plant and equipment required for construction.

The plan outlined will have regard to the following elements:

- Mobile bowsers, tanks and drums will be stored in a secure, impermeable storage area, away from drains and open water;
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- 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;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and
- An emergency spill kit with oil boom and absorbers will be kept on site in the event of an accidental spill.

A detailed fuel and oil management plan can be found in the CEMP.

Refuelling of Construction Plant On-Site

The following measures will be undertaken to avoid or minimise negative effects to water quality as a result of the use of hydrocarbons:

- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;
- To reduce the potential for oil leaks, only mechanically sound vehicles and machinery will be allowed onto the site. An up to date service record will be required from the main contractor;
- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility;
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery;
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.

Construction Wheel Wash

A Construction Wheel Wash will be used for vehicle wheels and undersides entering and leaving the construction site. Water residue from the wheel wash will be fed through a settlement pond for settling out of suspended solids. The wheel wash area will be cleaned regularly so as to avoid the buildup of residue. While these measures pertain to hydrology, and are included in the CEMP, they also relate to aquatic biodiversity, so are included here.

Temporary Construction Compound

The following measures will be undertaken to avoid or minimise negative effects to water quality as a result of the erection of the temporary compound:

- Drainage within the temporary site compound will be directed to an oil interceptor to prevent pollution if any spillage occur;
- A bunded containment area will be provided within the compound for the storage of fuels, lubricants, oils etc.; and
- The compound will be in place for the duration of the construction phase and will be removed once commissioning is complete.

Temporary Local Road Widening

The following will be undertaken to avoid or minimise negative effects to water quality as a result of the temporary local road widening works:

- Silt fencing will be erected around the perimeter of the works area;
- There will be no refuelling or storage of fuels etc. at the location;
- There will be no stockpiling of materials;
- Fuel/spill kits will be readily available;
- The widening works will be in place for the duration of deliveries and will be removed/reinstated following delivery.

Storage

The storage of materials, containers, stockpiles, and waste, however temporary, will follow best practice at all times and be stored at designated areas. Storage will be located as follows:

- Away from drains and sensitive habitats (IEFs);
- On an impermeable base;
- Under cover to prevent damage from the elements;
- In secure areas; and
- Well away from moving plant, machinery and vehicles.

All containers will be stored upright and clearly labelled. Sufficient storage will be supplied near to all working areas.

Excavation Works

Excavation works relate mainly to trench digging and excavations. Mitigation in soil management as outlined in Chapter 9 Land and Soil will also apply. The following measures will be undertaken to avoid or minimise negative effects to water quality as a result of excavation works:

- Earth movement activities will be suspended during periods of prolonged rainfall events;
- The earthworks material will be placed and compacted in layers to prevent water ingress and degradation of the material; and
- Drainage and associated pollution control measures will be implemented on site before the main body of construction activity commences.

Excavated Materials and Soil Management

All soils generated from excavation works within the wind farm associated with turbines, access track, substation, grid connection and internal cable construction will be retained on site and reused in bunding, landscaping and restoration of the borrow pit and deposition areas. No soils will be removed from the site. Permanent stockpiling of soils will not take place.

During excavations in the existing tracks, excavated material will be temporarily stockpiled adjacent to the section of trench, with appropriate material used as backfill. Appropriate siltation measures will be put in place prior to excavations. Stockpiles will be stored a minimum of 50m back from rivers/streams on level ground with a silt barrier installed at the base.

6.5.2.2 Operational Phase

The following operational phase (monitoring) mitigation measures will be implemented with regard to the proposed development.

Water quality

The measures for control of runoff and sediment relate to the construction phase of the project when there is continuous movement of site vehicles and delivery vehicles moving around the wind farm site. Following construction, the amount of on-site traffic will be very low and there will be negligible risk of sediment runoff. Runoff from the access tracks, hard-standings, and other works areas will continue to be directed to settlement ponds and from there to the outfall weirs. Check dams within the drainage channels will also remain in place. The retention of this drainage infrastructure will ensure that runoff continues to be attenuated and dispersed across existing vegetation before reaching the downstream receiving waters. This infrastructure will be inspected regularly by the operational maintenance personnel.

Water monitoring will be updated prior to the commencement of the proposed development and will be undertaken monthly for a period of 6 months prior to commencement of construction. During the construction phase of the project, weekly field surface water quality chemistry monitoring will be undertaken with reasonable frequency.

The regular inspections during the operational phase will ensure culverts are free from blockages, and there is no damage or erosion of the stream crossing wing walls, particularly after storm events. Silt ponds will also be inspected and maintained before the drains and verges have vegetated.

It is important to keep ecological disruption of watercourses to a minimum and to maintain the aquatic ecosystem in a healthy, functional condition. Biological water quality monitoring will be undertaken to monitor surface water quality during the operational phase.

Macroinvertebrates will be sampled annually on the first, second and third years at aquatic sites listed in the aquatic report, and in future years if there is instability in the macroinvertebrate communities. Biotic indices corresponding with those used in the aquatic report, as well as Functional Feeding Group Analysis will be carried out in line with the methodology described the aquatic report. A key biotic index in this regard is the Quality Rating System. This biotic index has been shown to be a robust and sensitive measure of riverine water quality and has been linked with both chemical status and land use pressures in catchments (Clabby *et al.*, 1992).

Bats

Bat mitigation outlined in Section 6.5.2.1 (turbine buffer felling) aimed at reducing the potential of bat collision risk will reduce the potential for collision related mortality and barotrauma.

A 'High' level of overall collision risk has not been identified for any bat species in any of the bat activity seasons. Based on best available information, a 'Low' to 'Moderate' overall collision risk level has been identified in relation to high-collision-risk bat species, in all three activity seasons, with the exception of a 'Moderate to High' risk for Common Pipistrelle in the autumn period.

Post-construction monitoring aims to assess changes in bat activity patterns (e.g. in response to landscape changes such as land management and forestry rotation) and the efficacy of mitigation outlined to inform any changes which may be required. Post-construction fatality monitoring and activity surveys will be undertaken in years 1, 2, 3, 5, 10 and 15 post construction. Post-construction monitoring will consist of:

- Passive bat monitoring at all turbine locations in order to monitor changes in activity levels relative to pre-construction baseline information (presented herein) along with collection of weather data simultaneously.
- Fatality monitoring following the methodology presented in Appendix 4 of NatureScot (2021) or any subsequent updates.
- Monitoring of proposed bat boxes by a bat-licensed Ecologist, and relocation of any boxes with no evidence of use in the first year after construction.

Post-construction monitoring data will be analysed and presented in report format to the planning authority (Clare County Council) and to NPWS annually.

The NPWS will be contacted to discuss the full scope and timing of these post construction surveys prior to the completion of the construction phase. Post construction bat monitoring will be developed in line with recommendations in Collins (2023), Marnell *et al*., (2022), SNH (2021) and those recommended by Bat Conservation Ireland (BCI, 2012) and any subsequent updates.

Curtailment measures will be considered further if monitoring identifies significant activity and / or bat fatalities. Such additional measures will include increases in cut-in speeds and /or curtailment. If required, each of these measures could be temporally and spatially focussed, e.g., only undertaken at individual turbines or in certain seasons at certain times.

To ensure that the keyhole clear felled areas do not, over time, develop into habitats supporting high value macroinvertebrate production that would comprise a prey resource for bats, control of regrowth of trees/encroachment of scrub will be monitored and physically controlled within buffer areas to maintain vegetation at low-height, and retain the NatureScot recommended 50m clearance setback around relevant turbines.

Bat boxes installed will be inspected within one year of erection, involving a daytime inspection of bat boxes using endoscope/thermal imagery scope. This will be undertaken for a minimum of 1 year. Seasonal inspection of bat boxes will be undertaken (excluding mid-June to mid-August, the lactation period of females, where any disturbance at this time can be detrimental to survival of young) to monitor bat usage and in wintertime for general wear and tear and to remove droppings following use the previous summer. This will be undertaken by a licensed bat-handler. Any boxes remaining unused after 1 year will be relocated (NRA, undated).

Habitats & Flora

An operational phase monitoring programme for habitat reinstatement areas will be developed by the Project Ecologist/ECoW and incorporated into the Biodiversity Enhancement Management Plan. This monitoring

programme will be implemented post-construction and will evaluate the success of habitat reinstatement areas. Any additional measures deemed necessary to further facilitate reinstatement of habitats will be incorporated into the monitoring program by the Project Ecologist/ECoW. This plan will be agreed in advance with NPWS. The plan will be updated in light of the operational conditions and any statutory requirements. Vegetation structure and suitability for marsh fritillary within habitat reinstatement and enhancement areas will be monitored in line with NBDC survey methodology.

Invasive species will continue to be monitored, and where required, managed throughout the operational phase, in accordance with the ISMP (see **Appendix 6F**).

6.5.2.3 Decommissioning Phase

If it is decided to decommission the wind farm at the end of its operational life of 35 years, a comprehensive reinstatement proposal, including the implementation of a program that details any removal of structures and landscaping, will be submitted to Clare County Council and the NPWS for approval prior to the decommissioning work.

The potential for impacts during decommissioning are similar in nature, if not in scope, to those assessed for the construction phase. All elements of the decommissioning works will be agreed with Clare County Council beforehand and in accordance with their requirements. The same mitigation for the construction phase of the wind farm will apply to the decommissioning phase. Any mitigation measures will be carried out using appropriate best practice at the time.

6.6 Residual Effects

Residual effects are those which are likely to occur even following the implementation of mitigation measures.

Mitigation measures are proposed in **Section 6.4.4.2** to provide robust and effective protection to Important Ecological Features likely to be affected by the proposed development in the absence of mitigation. As set out in **Table 6-32**, any residual effects are outlined after taking account of the mitigation proposed. For the likely significant effects assessed, application of the mitigation measures in full will limit residual effects.

With the full implementation of the mitigation measures outlined in **Section 6.4.4.2**, above, it is not likely that significant adverse effects, to the IEF habitats and species identified for appraisal in this chapter, will arise. It is considered that the receiving environment within the Proposed development site has the capacity to accommodate the Proposed development without significant effects on habitats and flora and faunal features discussed in this chapter. The watercourses downstream are considered to have assimilation capacity adequate to absorb water quality effects to a level that would not have significant effects on aquatic biota or water quality status.

It is considered that the effects on IEFs from potential construction, operation and decommissioning impacts will be avoided, reduced and mitigated sufficiently to ensure that no likely significant effects remain, will the full implementation of the ecological mitigation measures.

There will be loss of habitats at the Proposed development site where hard surfaces exist at operational stage. This unavoidable loss is independently assessed as a **likely, permanent, significant negative** effect. Elsewhere on site, existing habitats will be preserved and/or improved, with plans to increase their biodiversity value, leading to an effect independently assessed as **likely, permanent, significant positive** effect. The overall effect on habitats is assessed as **likely, slight positive** taking into account the greater proportion of habitat converted for overall

biodiversity net gain beyond that which already exists within the proposed development site prior to development and beyond that which would exist in a do-nothing scenario.

There will be an increased human presence in the locality with an expected associated increase in noise and disturbance during construction stage. For fauna, it is considered that the residual effects will be **likely, insignificant negative** with the implementation of the appropriate mitigation measures and best practice methodologies provided in the CEMP. The effect on aquatic features will be **likely, insignificant negative** taking account of the CEMP and planned clear spanning of waterways on site. A summary of the unmitigated effects of the construction and operational phases, and then including mitigation and residual effects, of the proposed development are detailed in **Table 6-32**. Decommissioning effects are expected to be similar to construction phase effects however reduced in magnitude.

Table 6-32: Summary Table of Effects

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Cloonlara House pNHA (National Importance)	None	Operational phase effects are assessed as **Long-term, Slight Negative Effects**.	Bat Survey report, detailed in **Appendix 6A**, notes the location of the proposed development site as being beyond the CSZ for species which may occur at Cloonlara House pNHA. Biodiversity Enhancement Management Plan details for bat monitoring including pre-construction surveys and pre-clearance inspection, ongoing monitoring as noted in **Section 6.5.2.1.**	**Long-term, Likely, Slight Not Significant Negative Effect**
Invasive Alien Plant Species (no value)	The introduction of Invasive Alien Plant Species during construction are assessed as having **Long-term, Likely Moderate Negative Effect**	Unlikely	Implementation of CEMP and ISMP, as noted in **Section 6.5.2.1.** Best Practice and Site Management particularly when working in proximity to watercourses	**Short-term, Likely, Imperceptible, Negative Effect**
Buildings & Artificial Surfaces (BL3) (Local Importance (higher value))	Direct habitat loss effects (0.05ha of BL3) are assessed as **Permanent, Likely, Moderate, Negative Effects**. Habitat disturbance effects from encroachment are assessed as **Short-term, Likely Slight Negative Effects.**	Unlikely	Habitat Loss; None required Habitat Disturbance: None required	**Permanent, Likely, Not Significant, Negative Effect**
Dry humid acid Grassland (GS3) (Local Importance (higher value))	Direct habitat loss effects (2.22ha loss of GS3) are assessed as **Permanent, Likely, Moderate, Negative Effects**. Habitat disturbance effects, i.e., encroachment from works, are assessed as **Short-term, Likely Slight Negative Effects**.	Unlikely	Habitat Loss: None, irreversible loss Habitat Disturbance: None required	**Permanent, Likely, Not Significant, Slight Negative Effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Scrub (WS1) (Local Importance (higher value))	Direct habitat loss effects (1.62ha loss of WS1) are assessed as **Permanent, Likely Moderate, Negative Effects**. Habitat disturbance effects, i.e., encroachment from works, are assessed as **Short-term, Likely Slight Negative Effects**.	Unlikely	Habitat Loss: Establishment of setback zones for watercourses will include scrub establishment for biodiversity as detailed in the BEMP, see **Appendix 6E**. Exclusion zones for rewilding areas will allow the establishment of scrub areas. Habitat Disturbance: None required	**Permanent, Likely, Not Significant, Negative Effect**.
Hedgerows (WL1)/ Treelines (WL2) (Local Importance (higher	Direct habitat loss effects (849m of WL1, 15m of WL2) are assessed as **Permanent, Likely Significant, Negative Effects.** Habitat disturbance effects are assessed as **Short-term, Likely Slight Negative Effects**	Unlikely	Habitat Loss: Biodiversity Enhancement Management Plan as noted in Section 6.5.2.1 Hedgerow and Treeline Reinstatement (approximately 1.3km of hedgerow and 307m of treeline) Habitat Disturbance: None required	**Permanent, Likely, Moderate, Positive, Effect.**
Mixed Broadleaf Woodland (WD1) (Local Importance (higher value))	Habitat loss effects (loss of 0.048ha of WD1 habitat) are assessed as **Permanent, Likely Not Significant Negative Effects**. Habitat disturbance effects, i.e., encroachment from works, are assessed as **Short-term, Likely Moderate Negative Effects**.	Unlikely	Habitat Loss: Biodiversity Enhancement Management Plan – reinstatement of 1.36ha of mixed broadleaf woodland. Habitat Disturbance: Avoidance of vegetation clearing during breeding season for birds and for trees during peak breeding season when young non-volant mammals may be present in dreys/dens for certain mammal species.	**Permanent, Likely Slight Positive Effect**
Wet Heath (HH3) (National Importance)	Habitat disturbance effects, i.e., encroachment from works and side-casting of materials are assessed as **Permanent, Likely, Slight Negative Effects**.	Unlikely	Best Practice and Site Management Implementation of CEMP and erection of exclusion zones as noted in **Section 6.5.2.1** Provision of ECoW.	**Permanent, Likely Imperceptible Negative effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Wet Grassland (GS4)/ Wet Heath (HH3) (Local Importance (higher value))	Direct habitat loss effects (0.0009ha loss of GS4/HH3)) are assessed as **Permanent, Likely Moderate Negative Effect** Habitat disturbance effects, i.e., encroachment and side-casting, are assessed as **Short-term, Likely Slight Negative Effects**.	Unlikely	Best Practice and Site Management Implementation of CEMP, establishment of exclusion zones as noted in Section 6.5.2.1 Drainage/preferential flow blocking in area to south of T1, south of T12 and along track between T10 and T7 and managed either by mowing or livestock density/frequency may allow for increasingly wet and species diverse habitat covering an area of approximately 3.8ha.	**Permanent, Likely Not Significant, Negative Effect**
Wet Grassland (GS4)/ Scrub (WS1) (Local Importance (higher value))	Habitat disturbance effects, i.e., encroachment and side-casting, are assessed as **Short-term, Likely Slight Negative Effects**	Unlikely	Best Practice and Site Management Implementation of CEMP – Rush and grazing management to prevent encroachment of either may be required where necessary. Further detailed in **Section 6.5.2.1.**	**Permanent, Likely Not Significant, Negative Effect**
Upland Blanket Bog (PB2)/ Wet heath (HH3) – Not conforming to EU Annex I habitats (National Importance)	Habitat disturbance effects limited to potential encroachment from works area, side-casting, etc., are assessed as **Short-term, Likely Slight Negative Effects**.	Unlikely	Drain blocking with mechanically installed peat dams where possible and with wooden dams or sandbags in others where more valuable/wetter, exclusion of areas of sections from extensive agriculture within the site and any future development. Details of the blocking locations are detailed in proposed biodiversity measures in Figure 2 of **Appendix 6E - Biodiversity Enhancement Management Plan**. Exclusion zones set up to prevent any entry of machinery to this habitat. Iterative design throughout the planning of the proposed development has taken into account the location of the habitat in order to ensure its conservation in relation to the proposed development. Provision of ECoW Implementation of CEMP and Best Practice and Site Management whilst working in proximity to this habitat. Enhancement Measures and management of this habitat including locations for enhancement measures are detailed	**Short-term, Likely Imperceptible Negative Effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
			in the **Biodiversity Enhancement Management Plan – Appendix 6E**	
Eroding/ upland rivers (FW1) (Local Importance (higher value))	Direct habitat loss effects (158m of river being culverted, though no loss to substrate habitats) are assessed as **Permanent, Likely Significant Negative Effects**. Habitat disturbance effects, i.e., potential run off of silt/sedimentation, ingress of cementitious material, fuel or oil, are assessed as **Short-term, Insignificant Negative Effects** with regards to water quality.	Unlikely	Implementation of CEMP and Surface Water Management Plan as detailed in **Section 6.5.2.1** Best Practice and Site Management when working in proximity to watercourses and management of culverts as noted in **Section 6.5.2.2**	**Permanent, Likely, Not Significant Negative effect**
Drainage Ditches (FW4) (Local Importance (higher value))	Direct habitat loss effects (approximate loss of 58m of FW4) are assessed as **Permanent, Likely Moderate Negative Effects.**	Unlikely	Retention of silt ponds for amphibians in post-construction phases Best Practice and Site Management Exclusion zones Implementation of CEMP as noted in **Section 6.5.2.1**	**Permanent, Likely, Not Significant Negative effect**
Hedgehog (Local Importance (higher value))	Habitat loss effects on hedgehog are assessed as **Short-term Slight Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**.	Unlikely	Pre vegetation clearance check as noted in **Section 6.5.2.1**	**Short-term, Likely Slight, Not Significant, Negative Effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Pygmy Shrew Local Importance (higher value))	Habitat loss effects on pygmy shrew are assessed as **Short-term Slight Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**.	Unlikely	Pre vegetation clearance check as noted in **Section 6.5.2.1**	**Short-term, Likely Slight, Not Significant, Negative Effect**
Common pipistrelle Soprano pipistrelle Leisler's bat Nathusius' bat (Local Importance (higher value)	The potential loss of tree PRFs on bats is assessed as **Permanent, Slight, Negative effects**. Habitat loss/vegetation removal (potential foraging/ commuting habitat) effects on bat species are assessed as **Permanent, Slight Negative effects**. Disturbance and/or displacement effects on bat species during the construction phase are assessed as **Short-term, Slight Negative effects.**	Collision with wind turbines during the operational phase is assessed as **Long-term, Slight Negative effects**. Disturbance/displacement during the operational phase is assessed as **Long-term, Slight Negative effects**.	Up to 98m buffer at all turbines. Turbine lighting detailed in **Section 6.5.2.1** Biodiversity Enhancement Management Plan, Implementation of CEMP, Best Practices and Site Management Ongoing bat monitoring as detailed in **Section 6.5.2.2**	**Permanent, Likely Not Significant Negative Effect**
Lesser Horseshoe bat Daubenton's bat Brown long-eared bat Whiskered bat	The potential loss of tree PRFs on bats is assessed as **Permanent, Slight, Negative effects**. Habitat loss/vegetation removal (potential foraging/ commuting habitat) effects on bat species are assessed as **Permanent, Slight Negative effects**.	Collision with wind turbines during the operational phase is assessed as **Long-term, Insignificant Negative effects**. Disturbance/displacement during the operational phase is assessed as **Long-term, Slight Negative effects**	Up to 98m buffer at all turbines. Turbine lighting as detailed in **Section 6.5.2.1** Biodiversity Enhancement Management Plan, Implementation of CEMP, Best Practices and Site Management Ongoing bat monitoring as detailed in **Section 6.5.2.2**	**Permanent, Likely Not Significant Negative Effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Myotis spp. (Local Importance (higher value))				
Badger (Local Importance (higher value))	Habitat loss effects on badger (loss of potential foraging and potential breeding/resting habitat) assessed as a **Short-term Slight Negative Effect**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Moderate Negative Effects**.	Unlikely	Biodiversity Enhancement Management Plan, Pre-construction surveys and implementation of CEMP as detailed in **Section 6.5.2.1**	**Short-term, Likely Not Significant, Negative Effect**
Irish hare (Local Importance (higher value))	Habitat loss effects as well as direct disturbance and/or displacement effect are assessed as being **Short-term Slight Negative Effects**	Unlikely	Pre vegetation clearance check as noted in **Section 6.5.2.1**	**Short-term, Likely Not Significant, Negative Effect**
Irish stoat (Local Importance (higher value))	Habitat loss effects as well as direct disturbance and/or displacement effect are assessed as being **Short-term Slight Negative Effects**	Unlikely	Pre vegetation clearance check Limit vegetation removal to avoid bird-nesting period (March – August) where possible as detailed in **Section 6.5.2.1**	**Short-term, Likely Not Significant, Negative Effect**
Otter (Local Importance (higher level))	No habitat loss effects on otter predicted. Direct disturbance and/or displacement effects during the	Unlikely	Biodiversity Enhancement Management Plan, Implementation of CEMP, Best Practices and Site Management Pre-construction surveys as noted in **Section 6.5.2.1**	**Short-term, Likely Not Significant Negative Effects**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
	construction phase are assessed as **Short-term, Slight Negative Effects**. Indirect disturbance and/or displacement effects during the construction phase are assessed as **Temporary to Short-term, Slight to Significant Negative Effects**.			
Pine Marten (Local Importance (higher value))	Habitat loss effects on pine marten are assessed as **Short-term Slight Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**.	Unlikely	Pre vegetation clearance check Limit felling to avoid March to April when young may be in dens as detailed in **Section 6.5.2.1**	**Short-term, Likely Not Significant Negative Effects**
Red Squirrel (Local Importance (higher value))	Habitat loss effects on red squirrel are assessed as **Short-term Slight Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**.	Unlikely	Forestry felling limit to avoid January – March period when young in dreys/dens as detailed in **Section 6.5.2.1**	**Short-term, Likely Not Significant, Negative Effect**
Marsh Fritillary (Local Importance (higher value))	No habitat loss effects for marsh fritillary predicted due to unsuitable nature of the habitats encompassed within the development site.	Disturbance and/or displacement effects on Marsh Fritillary during the operational phase are assessed as **Long-term, Insignificant Negative Effect**.	The protection and avoidance of works in pollinator-friendly habitats, side casting of materials to the opposite side where any suitable habitat may occur under ECoW guidance as noted in the Biodiversity Enhancement Management Plan. Implementation of CEMP, noted in **Section 6.5.2.1** Best Practices and Site Management	**Long-term, Likely Not Significant Negative Effect**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
	Indirect disturbance and/or displacement effects are assessed as **Short-term, Moderate Negative Effects**.		Marsh fritillary habitat identified within the study area will be marked and fenced off prior to the commencement of works Operational phase monitoring programme and ECoW as detailed in **Section 6.5.2.2**	
Other terrestrial macro-invertebrates (Local Importance (higher value))	Disturbance, displacement effects on other terrestrial macro-invertebrate species are assessed as **Temporary to Permanent, Slight to Moderate Negative effects**.	Disturbance and/or displacement effects on terrestrial macro-invertebrates during the operational phase are assessed as **Long-term, Insignificant Negative Effect**.	Large timber from sections of tree or branches generated from felling which are not required to be removed off-site will be retained and stacked in piles at appropriate locations for damp refugia for invertebrates and constructed under ECoW supervision, as well as side casting materials to the opposite side of areas where butterfly species and other pollinators may occur as noted in the Biodiversity Enhancement Management Plan.	**Long-term, Likely, Slight Not Significant Negative Effect**
Common Frog (Local Importance (higher value))	Habitat loss effects on common frog are assessed as **Long-term, Slight Negative Effects**. Direct disturbance and/or displacement effects during the construction phase are assessed as **Short-term Slight Negative Effects**. Indirect disturbance and/or displacement effects during the construction phase are assessed as **Temporary to Short-term, Slight to Moderate Negative Effects**.	**Long-term neutral Effect**	Pre-construction checks and translocation to nearby suitable aquatic habitat if required as detailed in the Biodiversity Enhancement Management Plan Amphibian surveys at pre-construction phase as detailed in **Section 6.5.2.1**	**Long-term, Likely Slight Not Significant Negative Effect.**
Atlantic Salmon (Local Importance (higher value))	No habitat loss effects on Atlantic salmon are predicted.	Disturbance and/or displacement effects on fish species during the operational phase are assessed as	Implementation of CEMP, as noted in **Section 6.5.2.1**, as well as the implementation of a site-specific Surface Water Management Plan has been designed for the Proposed development to avoid/minimize impacts to water quality	**Long-term, Likely, Not Significant Negative Effect.**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
	Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Moderate Negative Effects.**	**Long-term, Insignificant Negative Effect.**	within and downstream of the site. Best Practices and Site Management for working in proximity to watercourses	
River Lamprey (Local Importance (higher value))	No habitat loss effects on river lamprey predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Moderate Negative Effects**.	Disturbance and/or displacement effects on fish species during the operational phase are assessed as **Long-term, Insignificant Negative Effect.**	Implementation of CEMP, see **Section 6.5.2.1**, and implementation of site-specific Surface Water Management Plan to avoid/minimize impacts to water quality within and downstream of the site, see **Section 6.5.2.2**, Best Practices and Site Management for working in proximity to watercourses	**Long-term, Likely Not Significant Negative Effect.**
Brook Lamprey (Local Importance (higher value))	No habitat loss effects on brook lamprey predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Significant Negative Effects**	Disturbance and/or displacement effects on fish species during the operational phase are assessed as **Long-term, Insignificant Negative Effect.**	Implementation for CEMP, **Section 6.5.2.1**, implementation of site-specific Surface Water Management Plan, see **Section 6.5.2.2**, to avoid/minimize impacts to water quality within and downstream of the site. Best Practices and Site Management for working in proximity to watercourses	**Long-term, Likely Slight Not Significant Negative Effect**
Other fish species (Local Importance (higher value))	No habitat loss effects on fish species (Brown trout and European eel) predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight to Significant Negative Effects**.	Disturbance and/or displacement effects on fish species during the operational phase are assessed as **Long-term, Insignificant Negative Effect.**	Implementation of CEMP, detailed in **Section 6.5.2.1**, implementation of site-specific Surface Water Management Plan to avoid/minimize impacts to water quality within and downstream of the site, see **Section 6.5.2.2** for details. Best Practices and Site Management for working in the vicinity of watercourses	**Long-term, Likely Slight Not Significant Negative Effect.**

IEF	Unmitigated Impacts		Mitigation	Residual Effects
	Construction	Operational		
Aquatic Macro-invertebrate (excluding FWPM and white-clawed crayfish) (Local Importance (higher value))	No habitat loss effects on aquatic macroinvertebrate species predicted. Indirect disturbance and/or displacement effects are assessed as **Temporary to Short-term, Likely Slight Negative Effects**.	Disturbance and/or displacement effects on aquatic macroinvertebrates during the operational phase are assessed as **Long-term, Neutral Effect.**	None	**Short-term, Slight Not Significant Negative Effect.**

6.7 Enhancement

A Biodiversity Enhancement Management Plan (BEMP) aimed at achieving biodiversity net gain within the Proposed development site will be implemented on-site under the guidance of the Project Ecologist/ECoW. The BEMP is included in Appendix 6E and details management and enhancement measures in relation to habitats and species within the site.

There follows a summary of enhancement measures which are proposed to increase the biodiversity value of the proposed development site. These are further described in detail in Appendix 6E.

Measures proposed in this document have been agreed with the individual landowners and will be implemented by the operator in conjunction with the landowners and overseen by project ecologist. The project ecologist will undertake to report the success or otherwise of said measures via operational compliance to the National Parks and Wildlife Service (NPWS) and Clare County Council.

6.7.1 Creation of Ponds/Wetland Habitat

Silt ponds will be constructed within the site at appropriate locations as a water quality protection measure, in line with the drainage design for the proposed project. Silt-ponds will be protected, where required, with stock-proof fencing. Silt ponds and any associated fencing will be retained following completion of construction works. These water-holding features will provide additional habitat within the site for a wide variety of aquatic and terrestrial macro-invertebrates, and amphibians, and in turn will support other biodiversity, such as birds and mammals. Over time, these areas will naturally develop into wetland areas as marginal and aquatic vegetation colonises, increasing biodiversity value.

6.7.2 Creation of Invertebrate Refugia (Deadwood/Log-Piles)

Any large pieces of timber (sections of tree-trunks/large branches) generated from felling to facilitate construction, which are not required to be removed off-site, will be retained and stacked in piles at appropriate locations within the site to create refuge habitat for species such as hedgehog and other small mammals, as well as invertebrates. Dead wood creates suitable habitat conditions for a wide variety of invertebrates and their larvae, which provide a food source for other fauna, including mammals and birds. These wood pile features will be constructed under ECoW supervision.

6.7.3 Retention and Enhancement of Existing Boundary Habitats

Existing internal treelines and hedgerows will be enhanced within the site, where possible, to improve their value as commuting corridors for bats and other wildlife, in particular those connected to the wider landscape, including woodland habitats. Large gaps/openings in existing linear features will be planted up with appropriate native shrubs and trees to improve structure and connectivity along features and deter livestock from breaking through features which can damage vegetation and structure.

As for newly planted hedgerows (Section 6.5.2.1 above), existing hedgerows and treelines will be managed for wildlife e.g., any cutting of hedgerows required will be undertaken to ensure that the overall structure and shape of the hedgerow provides adequate cover and shelter for wildlife. Variation in structure and height will provide habitat of higher value for wildlife. Any hedgerow maintenance will be undertaken on a 3–4-year rotational cutting cycle. Suitable cutting equipment will be used to minimise unnecessary flaying and shredding of hedgerow vegetation to reduce risk of long-term damage and disease.

Hedgerow maintenance will be prohibited during the bird nesting season (March – August, inclusive), which will also have positive effects on other wildlife, such as insects. Native trees will be used for all planting and enhancement of woodland and tree habitats.

6.7.4 Linear Wildflower Meadow Habitat

Sections of proposed internal access tracks will be planted with a suitable wildflower mix to create areas of wildflower meadow which will have value for a wide variety of invertebrates and other species within the site. A wildflower mix will be sowed within linear 2 m wide strips adjoining sections of access tracks. The seed mix used will be comprised exclusively of native Irish wildflower species and will be sown at the appropriate time of year and following suitable ground preparation to maximise seedling success. Areas proposed to be sown with wildflowers are shown on a map in the BEMP (Appendix 6E).

6.7.5 Bat-box Scheme (Additional artificial roost-sites)

It is proposed that a bat-box scheme is implemented to enhance the value of the site for bats by providing additional artificial roost-sites. The bat box scheme will be initiated prior to commencement of the development (NRA, undated).

Bat-boxes (minimum 10 No.) will be erected in suitable foraging habitat and will comprise a mix of bat-box designs to attract multiple bat species (e.g. Miramare boxes are designed for woodland species such as brown long-eared bat, while other designs such as the Schwegler Woodcrete bat boxes are suitable for species such as common pipistrelle, soprano pipistrelle, Leisler's bats and brown long-eared bats, all of which were recorded within the site). For more information, please refer to the BEMP.

The design, siting and installation of the bat-boxes will be as per NRA (undated) and undertaken by a bat specialist and/or the Project Ecologist/ECoW.

6.7.6 Monitoring

An operational phase monitoring programme for areas of habitat enhancement and other biodiversity enhancement measures has been developed by the Project Ecologist/ECoW and incorporated into the BEMP. This monitoring programme will be implemented during construction and operation and will evaluate the success of biodiversity enhancement measures within the site in consultation with NPWS and Clare County Council.

6.8 Conclusion

With the construction and operation of the proposed wind farm development in accordance with the design, best practice and mitigation measures proposed, significant residual effects on biodiversity are not likely on any Important Ecological Feature (IEF).

The proposed development application area is largely composed of agricultural grassland and commercial conifer tree plantation throughout much of the area. Mitigation and monitoring measures both designed in consideration of the proposed development and as part of its management, have been designed to offset any significant direct or indirect effect which may result in residual significant impacts to IEFs considered. No habitats conforming to EU Annex I habitats are located within the proposed development boundary and those of importance, including areas of upland blanket bog and wet heath, have been actively avoided by iterative design.

Species identified as IEFs have been avoided where possible and mitigation outlined in Section 6.5 will minimise adverse effects as a result of the proposed development which ultimately will result in no likely significant negative residual effect. Furthermore, the creation and reinstatement of habitats, and enhancement of others, throughout the proposed development site will result in a net area gain for many IEF habitats including hedgerows and treelines, which will result in greater habitat areas occurring than previously existed in the area prior to development. The proposed development will not result in a residual loss of habitats of high ecological significance and the application of mitigation and protection measures throughout the construction and operational phases will ensure that no significant residual effects are likely to arise from the project, either alone or in combination with other plans or projects.

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