6 BIODIVERSITY

6.1 INTRODUCTION

This chapter assesses the likely significant effects of the Project on ecology, both terrestrial and aquatic, and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified. The residual ecological effects are then assessed.

The Proposed Development refers to all elements of the application within the Redline Boundary, as set out in detail in **Chapter 2: Development Description**. The principal elements include the wind turbines, all site infrastructure, the Grid Connection Route (GCR) and the section of the Turbine Delivery Route (TDR) where works are required.

The assessment considers the potential effects during the following phases of the Proposed Development:

- Construction of the Proposed Development
- Operation of the Proposed Development
- Decommissioning of the Proposed Development

This chapter of the EIAR is supported by **Figures (6.1 - 6.2)** provided in **Volume III** and by the following Appendix documents provided in **Volume IV** of this EIAR:

- **Appendix 6.1 Plant species lists for main habitats within the Proposed Wind Farm Site**
- **Appendix 6.2 Bat Survey Report, Tirawley Proposed Wind Farm. Eire Ecology Environmental Consultants, April 2026**
- **Appendix 6.3 Aquatic Ecology Assessment, Tirawley Wind Farm. Ecofact Environmental Consultants, April 2026**
- **Appendix 6.4 Biodiversity Enhancement and Management Plan (BEMP)**
- **Appendix 6.5 Note on Lifespan of Baseline Ecological Survey Data**

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in Technical **Appendix 2.1**. This document will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect biodiversity and the environment, are implemented.

6.1.1 Development Description

Planning Permission is being sought by the Developer for the construction of 16 no. Wind Turbines with an approximate output of 68.8 MW, 1 No. meteorological mast, a Permanent

Operations Compound, an on-site substation, a Battery Energy Storage System (BESS) and all ancillary works, works along the TDR and the construction of an underground Grid Connection to Tawnaghmore 110 kV substation, Killala Business Park, Co. Mayo.

A detailed description of the Proposed Development has been included in **Chapter 2: Development Description**. An outline of the Proposed Development will consist of the following:

- Construction of 16 no. Vestas V117 (4.3 MW) IEC IIA – T wind turbines. This specific model with a blade tip height of 135 m, was selected as the candidate turbine and its associated parameters were used to determine the significant environmental effects associated with the Proposed Development. No flexibility in terms of turbines dimensions is sought as part of the application for Planning Permission.
- Construction of permanent Turbine Hardstands and Turbine Foundations.
- Change the use of a residential site and vacant dwelling to a Permanent Operations Compound consisting of an operations office, storage area and staff parking.
- Construction of two Temporary Construction Compounds with associated temporary site offices, parking areas and security fencing.
- Installation of 1 no. (35-year life cycle) meteorological mast with a height of up to 80 m and a 4 m lightning pole on top.
- Development of 17 no. permanent onsite spoil deposition areas.
- Construct 5 no. new permanent site entrances as described in the EIAR **Chapter 17: Traffic and Transport** and **Figure 2.1**.
- Upgrade 9 no. existing site entrances as described in the EIAR **Chapter 17**: **Traffic and Transport** and **Figure 2.1.**
- Works for new and upgraded entrances include clearing visibility splays of vegetation, widening the entrances to allow HGVs turn onto local public roads and the R314, excavation to solid formation level, installation roadside drainage features, placing entrance sub-base with rockfill materials, placing capping level and providing surface dressing where necessary.
- Road construction works within the Wind Farm Site consisting of the construction of approximately 9.64 km of new Site Access Tracks through the Wind Farm Site. The upgrading of 1.76 km of private Access Tracks and 1.58 km of public roads within the Wind Farm Site, road verge widening, hedge trimming and all associated infrastructure and drainage works as described in EIAR **Chapter 17: Traffic and Transport** and the **Turbine Delivery Route Report Appendix 17.1.**
- Forestry felling of approximately 31.86 ha of coniferous forest will be required to facilitate the construction of the Proposed Development. For the purposes of this

Proposed Development, the Developer commits that the location of any replanting (alternative afforestation) associated with the Proposed Development will be greater than 10 km from the Wind Farm Site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the Proposed Development is located. The extent of felling required to be licensed for the purpose of giving effect to the Proposed Development can only be determined once planning permission for the Proposed Development has been granted. It will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted. The felling will be subject to a separate planning application which, in practical terms, can only be made once planning permission for the Proposed Development has been granted.

- All associated site development works including berms, landscaping, and soil excavation.
- Development of an internal site drainage network and sediment control systems.
- Construction of 1 no. 110 kV electrical substation including 2 no. control buildings with welfare facilities, all associated electrical plant and equipment, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works (the 'Wind Farm substation').
- Installation of battery arrays located within container units (20 no. units) and associated electrical plant for grid stabilisation adjacent to the Onsite Substation building (with up to 150 MW storage capacity) with surrounding palisade fence 2.65 m in height;
- All associated underground electrical and communications cabling connecting the wind turbines to the Wind Farm substation.
- All works associated with the permanent connection of the Wind Farm to the national electricity grid comprising of a 110 kV underground cable system in permanent cable ducts from the proposed, Wind Farm substation, in the townland of Barroe to the existing Tawnaghmore substation at the Killala Business Park.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire Wind Farm (apart from the substation) is being sought. This reflects the lifespan of modern-day turbines.

The EIAR assesses the Project which includes the Proposed Development as outlined above; it includes improvements and temporary accommodation requirements to the existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery.

Planning permission is being sought for an Onsite 110 kV Substation and an underground Grid Connection to the existing Tawnaghmore 110 kV Substation located in Killala Business Park. This infrastructure will become an asset of the national grid under the management of EirGrid and will remain in place upon decommissioning of the Wind Farm.

6.1.2 Project Team

This ecology chapter has been prepared by Dr. Brian Madden (BioSphere Environmental Services) and is informed by ecological survey data and relevant reports from various ecologists as listed in **Table 6.1** below.

Table 6.1: Personnel involved in ecological assessment.

Project Team Member	Qualifications & Experience	Role
Dr Brian Madden, BioSphere Environmental Services	BA. Mod. (Hons), PhD, MCIEEM Brian graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D. degree in 1990 from the National University of Ireland for his research on ecosystem processes in raised bogs. Since 1994, Brian has been the principal ecologist with BioSphere Environmental Services. Brian has carried out botanical surveys and habitat assessments for most terrestrial habitats which occur on the island of Ireland. He is also an experienced ornithologist, with particular interests in birds of prey and wetland birds. He has published a range of peer-reviewed research papers. Examples of energy projects that Brian has been involved in include: Grousemount Wind Farm, Cos. Cork/Kerry, Oweninny Wind Farm Phases 1 & 2, Co. Mayo, Castlepook Wind Farm, Co. Cork, Letteragh Wind Farm, Co. Clare, Kiltumper Wind Farm Co. Clare, Eglish Wind Farm, Co Tyrone, Connemara 110kV Overhead Line Reinforcement Project (40 km from Barna to Screeb Bay in Connemara.	Preparation of EIAR Chapter 6; habitat assessment; terrestrial mammal survey
Dr John Conaghan, Enviroscope Environmental Consultancy	BSc, PhD, MCIEEM John has over 25 year's experience of working on botanical projects throughout Ireland. He is a habitat specialist, with particular expertise in peatland and wetland habitats, as well as rare plants. John has worked with Coillte on their LIFE funded habitat restoration programme - he regularly contributes this expertise to Species and Habitat Management Plans.	Habitat and botanical surveys; Report input

Project Team Member	Qualifications & Experience	Role
	Examples of energy projects that John has been involved in include: Oweninny Wind Farm Phases 1 & 2, Co. Mayo, The Galway Wind Park, Grousemount Wind Farm, Cos. Cork/Kerry, Castlepook Wind Farm, Co. Cork, BGE Corrib Gas Pipeline from Bellanaboy, Co. Mayo to Craughwell, Co. Galway.	
John Curtin, Eire Ecology	BSc, Environmental Science (NUI Galway) John has been carrying out bat surveys at wind farm sites since 2012 and has completed all standard training for such work through Bat Conservation Ireland, Bat Detector Workshop and Bat Handling Workshop. John holds the relevant licences for handling and photographing bats. Examples of energy projects that John has provided bat assessments for include Yellow River Wind Farm, Co. Offaly, Boggeragh Wind Farm, Co. Cork, Cappawhite B Wind Farm, Co. Tipperary, Glenmore Wind Farm, Co. Clare.	Implementation of Bat Survey for project, badger survey Analysis of bat data and preparation of risk assessment and mitigation report (**Appendix 6.2**)
Dr William O'Connor, Ecofact Environmental Consultants	PhD, MSc, BSc, CBiol, CEnv, FRSB, MCIEEM Member of the Institute of Fisheries Management William has over 30 years experience working in aquatic ecology throughout Ireland. He regularly assesses impacts on aquatic ecology for wind energy projects.	Aquatic ecology field surveys and preparation of Aquatic Ecology Assessment report (**Appendix 6.3**)

6.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

6.2.1 Purpose of the Report

The purpose of this report is to:

- Establish and evaluate the baseline ecological environment as relevant to the Proposed Development.
- Identify, describe and assess all potentially significant ecological effects associated with the Proposed Development.
- Set out the prevention and mitigation measures required to address any potentially significant ecological effects and ensure compliance with relevant nature conservation legislation.
- Provide an assessment of the significance of any residual ecological effects.
- Identify any appropriate enhancement and / or post-construction monitoring requirements.

6.2.2 Relevant Legislation and Policy

The main pieces of legislation relevant to this chapter are as follows:

- The Wildlife Acts 1976 – 2022 as amended.
- The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) as amended.
- European Communities (Birds and Natural Habitats) Regulations 2011 – 2021.
- Flora (Protection) Order, 2022 (S.I. No. 235 of 2022).
- Fisheries (Consolidation) Act, 1959.
- Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act).

In considering ecological survey and assessment of effects of the Proposed Development, regard was made to the following key guidance and information documents:

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022).
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended).
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes.
- CIEEM (2024). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Fossitt (2000). A Guide to Habitats in Ireland. Heritage Council, Kilkenny.
- Smith et al. (2011). Best Practice Guidance for Habitat Survey and Mapping in Ireland.
- Bats and onshore wind turbines: Survey, Assessment and Mitigations. Scottish Natural Heritage January, 2019.
- Bats and onshore wind turbines - Survey, Assessment and Mitigation. Scottish Natural Heritage. August 2021
- Bat Conservation Ireland Guidelines for consideration of bats in wind farm projects - Revision 2014
- BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Pelagic Publishing, Exeter UK.
- CIEEM (2021). Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats. Beta version 1.0.
- Collins, J. (Editor) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). Bat Conservation Trust, London.

- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

6.2.3 The Study Area

For habitats and flora species, the main study area is all land within the Redline Boundary. However, consideration is given to the potential for sensitive habitats, such as bogs, fens, springs etc., or protected or rare plant species (including bryophytes), to a distance of up to 1 km of the Redline Boundary, but more should ecological or hydrological connectivity exist. Such habitats may be part of designated sites at a national or international level.

For terrestrial mammal species, badger and otter are identified as the principal species likely to be affected by the construction of the Proposed Development. For badger, the main study area was a distance of approximately 100 m of the proposed infrastructure locations (after NRA 2006 & NRA 2009b). For otter, the main study area was a distance of at least 150 m upstream and downstream of the sections of river potentially affected by the proposed infrastructural works, including the margins of the river to a distance of 10 m width. Generally, the potential of watercourses to support otter was based on stream size and water quality.

For bats, the desk review study area extended to a distance of 6 km for roost sites and to 4 km for known caves. A habitat assessment for bat potential, including assessment of value of trees as bat roosts, was carried out to a distance of 200 m of the locations for the proposed turbines (following BCI Guidelines Ver. 2.8, 2012, NIEA 2021, NatureScot 2021).

For aquatic ecology, all watercourses/water bodies which could be affected directly (*i.e.* within the site) or indirectly (*i.e.* in drain areas close to the site) were considered as part of the current appraisal.

Table 6.2: Summary of study areas for main ecological receptors.

Receptor	Study Area Definition	References
Habitats & Flora	Redline Boundary of site for core baseline survey;	Department of Environment, Heritage and Local Government 2010

Receptor	Study Area Definition	References
	Extending to 1 km or beyond Redline Boundary for sensitive habitats and plant species	
Badger	100 m (minimum) from works area	NRA 2006; NRA 2009b
Otter	150 m (minimum) upstream and downstream of watercourse crossing points	NRA 2008; NRA 2009b
Bats	200 m from works area; Up to 6 km for bat roost desk review	BCI 2012 Nature Scot 2021 NIEA 2021
Aquatic ecology	All watercourses / water bodies within the Redline Boundary of site, as well as those downstream of site which could be affected indirectly	NRA 2009a

6.2.4 Zone of Influence

The Zone of Influence (ZoI), or distance over which potentially significant effects may occur, will differ across the Key Ecological Receptors (KERs), depending on the potential impact pathway(s). The results of both the desk study and the suite of ecological field surveys undertaken have established the habitats and species present within, and in the vicinity of, the Proposed Development. The ZoI and study area was then informed and defined by the sensitivities of each of the KERs present, in conjunction with the nature and potential impacts associated with the Proposed Development.

The ZoI in relation to direct impacts on habitats and flora and fauna species as a result of Tirawley Wind Farm will be confined to the area within the Redline Boundary of the Proposed Development, including the Grid Connection and TDRs.

The ZoI of general construction activities (i.e. risk of spreading/introducing non-native invasive species, dust deposition and disturbance due to increased noise, vibration, human presence and lighting) is not likely to extend more than several hundred metres from the proposed Redline Boundary but could be further for bats.

The ZoI of potential impacts on surface water quality in the receiving environment, and associated aquatic flora and fauna, could extend downstream for up to 15 km (following UK guidance, Scott Wilson *et al.* 2006) but possibly more. For the TDRs, the ZoI is confined to the portions of the route where road upgrade works are required.

6.2.5 Desk Study

A comprehensive desktop review was carried out to identify features of ecological importance within the Proposed Development area and surrounding region. This comprised a review of available ecological data, including the following:

- Online web-mapper of National Parks and Wildlife Service (NPWS) for data on sites designated for nature conservation (European & National) and on protected flora species and protected bryophytes (see www.npws.ie/protected-sites - last accessed 17/04/26),
- Online web-mapper of National Biodiversity Data Centre for protected species datasets (see http://maps.biodiversityireland.ie – last accessed 13/04/26)

For bats, data searches of the Wind Farm Site location were conducted in April 2022, July 2023, September 2025 and March 2026. The following information sources were examined:

- Known bat records within a 10 km radius of the proposed sites from the Bat Conservation Ireland database.
- Adhoc and observational bat records from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie).
- Review of Ordnance Survey mapping and aerial photography of the proposed Wind Farm boundaries and their environs (i.e. 200 m plus rotor radius of the boundary of the Proposed Development).
- Records of designated sites within a 6 km radius of the proposed sites where bats form part or all of the reason for designation (https://www.npws.ie/protected-sites).
- Collation of data on known caves within a 4 km radius of the proposed sites from the Cave Database for the Republic of Ireland, compiled by Trinity College (http://www.ubss.org.uk/search_irishcaves.php).
- Review of bat survey data from Ecological Impact Assessments from proposed and permitted developments within the wider environs of the site.
- Bat Tree Habitat Key Database (BTHK) was examined in order to assess likelihood of bats roosting in conifer plantation.

For aquatic ecology, the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie) was accessed for any records of sensitive aquatic ecology receptors. The Proposed Development lies within the 10 km grid squares G13, G12, and G22 (aquatic macroinvertebrate records were checked for downstream areas also; G23). All the records for the Glencullin North Mayo sub catchment (Glencullin[NorthMayo]_SC_010), Cloonaghmore sub catchment

(Cloonaghmore_SC_010), and Abbeytown sub catchment (Abbeytown_SC_010) were reviewed (see **Appendix 6.3** for full details of online search).

The National Parks and Wildlife Service (www.npws.ie) website and online maps were also accessed in relation to designated areas, qualifying interests, and site synopses on relevant Special Areas of Conservation with regard to aquatic ecology.

The Environmental Protection Agency (www.gis.epa.ie/EPAMaps/) websites including Catchments.ie (www.catchments.ie) and publications relating to the Water Framework Directive (WFD) were accessed to identify watercourse in study area, in relation to water quality status, and also water quality pressures in the study area. Similarly, any relevant information on the website of Inland Fisheries Ireland (www.fisheriesireland.ie) was reviewed. The Environmental Sensitivity Mapping (ESM) tool was also used to gather data on aquatic biodiversity, flora, and fauna in the study area.

6.2.6 Consultation

As part of the study, consultation was made with the following relevant ecological parties (see **Chapter 1: Table 1.14**):

- National Parks and Wildlife Services of the Department of Housing, Local Government and Heritage (no response received).
- BirdWatch Ireland (no response received).
- An Taisce (no response received).
- Irish Peatland Conservation Council (no response received).
- Inland Fisheries Ireland – written Scoping Opinion received on 12th June 2023.

6.2.7 Field Surveys

6.2.7.1 Habitats, vegetation and flora

The site of the Proposed Tirawley Wind Farm Development was visited on various dates between May 2022 and February 2024, as follows: 19th & 20th May 2022, 12th & 13th August 2022, 9th September 2022, 15th & 16th May 2023, 7th September 2023, 15th December 2023 and 25th February 2024. A final cursory visit was made to the site on 16th April 2026. The prolonged survey period reflected the various design changes during the planning of the Proposed Development.

Walkover surveys were carried out where proposed Wind Farm infrastructure is located, with focus on the location of each turbine and associated new Site Access Tracks from public roads. The surveys also included the Permanent Operations Buildings, the proposed

substation and BESS, compounds, the main peat and mineral soil storage areas within an abandoned quarry at Lackan Hill, together with 16 no. other discrete sites within the Redline Boundary, and the proposed Met Mast location.

The preferred GCR and any relevant sections of the TDR were surveyed by driving the routes with stops for a walkover inspection at potential areas of ecological interest such as stream crossings or where works are proposed.

Habitats within the study area were classified in accordance with 'A Guide to Habitats in Ireland' (Fossitt 2000). The dominant plant species present in each habitat type were recorded during the field surveys. This is considered sufficient to allow accurate classification of the habitats present. The extents and details of classified habitats were recorded and mapped using GIS. Where relevant, linkages with the EU Habitats Directive classification system are given.

During the various site surveys particular attention was paid to the possible occurrence of plant species listed in either the Flora (Protection) Order 2022 or the Irish Red Data Books (Curtis and McGough 1988, Lockhart *et al.* 2012). Vascular plant species nomenclature in this report follows Stace (2010) while that of mosses follows Smith (2004).

During the surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 – 2021 was conducted[1]. Invasive alien species which are widespread in Ireland, including Co. Mayo, include Japanese knotweed, rhododendron, giant hogweed and Himalayan balsam. The mapping of habitats was assisted by the use of aerial photography (OSI Geohive & BING online websites).

6.2.7.2 Terrestrial fauna

Multi-disciplinary walkover surveys of the Wind Farm Site were carried out over various dates as follows: 21st May 2022, 13th & 14th October 2023, 14th December 2023 and 7th & 8th February 2024 in accordance with NRA guidelines on Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes (NRA, 2009b). In addition, observations on fauna were also made when surveyors were engaged in habitat assessments and bird surveys.

[1] http://Invasives.biodiversityireland.ie/

The walkover surveys were designed to detect the presence, or likely presence, of a range of protected species, including badger *Meles meles* and otter *Lutra lutra*. Terrestrial mammal species were detected by direct observations and by search for signs, such as setts, tracks or feeding signs.

At the Wind Farm Site, survey for badger was focused on local hedgerows for turbines located within grassland fields and the marginal areas and firebreaks of the conifer plantations for turbines located within forestry. The areas were walked and checked for signs of badger presence, including setts, latrines, snuffle holes, prints, paths and tree scratching.

For otter, emphasis was placed on impact locations of rivers and main stream courses within the Wind Farm Site and along the GCR. At such locations, a distance of approximately 100 m upstream and downstream was searched for otter signs, such as spraints, prints, slides, trails and holts along both banks of the stream. In addition to the width of the stream, a 10 m riparian buffer (both banks) was considered to comprise part of the otter habitat (NPWS 2009). The dedicated otter survey followed the guidance as set out in NRA (2008) *Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes.* The otter survey was supplemented by survey information from the Aquatic Ecology Assessment (**Appendix 6.3**).

Habitats within the Wind Farm Site were evaluated for their potential to support breeding amphibians, namely the common frog *Rana temporaria* and the smooth newt *Lissotriton vulgaris,* as well as the common lizard *Zootoca vivipara,* with any sightings recorded whilst carrying out the habitat and mammal surveys.

6.2.7.3 Bats

In order to assess the presence and activity of bats associated with the Proposed Development, the following surveys were undertaken within and adjacent to the Redline Boundary for the Proposed Development:

- Bat activity and emergence surveys (walked & driven transects)
- Static detector surveys (four survey periods); and.
- Wintertime tree roost assessment.

All surveys adhered to SNH (2021) guidelines, while also taking on board aspects of NIEA (2021) guidance.

Activity and emergence surveys

The bat detectors used during the walked and driven surveys were Wildlife Acoustics Inc. (Massachusetts, USA) Echo Meter Touch Pro 2 which are triggered to record when a bat call is emitted louder than 18 dB for 1sec. These detectors use full spectrum sampling; detecting all frequencies simultaneously, meaning that multiple bat calls can be recorded at the same time.

Night-time surveys combined emergence surveys towards dusk and dawn and a combination of walked and driven transects of bat favourable habitats within and surrounding the study were conducted between June to August 2022, while additional emergence surveys were conducted in June 2024 and April 2026.

Transects targeted a range of foraging and commuting habitats present within and surrounding the study area, those associated with linear features such as roadside margins, woodland plantation edges, hedgerows, treelines and waterbodies. Details of transects are presented in **Appendix 6.2**.

In addition to audio recording, multiple NVA's were used to assist the onsite surveyors.

These include:

- Track IR Pro 19mm thermal imaging scope.
- Track IR Guide Pro TK thermal imaging scope.
- Canon XA10 night vision camcorder supplemented with two Nightfox IR torches
- Pixfra Thermal scope.

Where possible, a positive identification to species level was made. Information on the behaviour was also recorded where available.

All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and temperature at 8 °C and greater).

Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (Wildlife Acoustic's Kaleidoscope Pro; version 5.6.8).

Static detector surveys

Song Meter Mini and SM4BAT Full spectrum bat recorders were deployed within the study area at the site of the proposed turbines for ten nights in the spring, summer, early autumn and late autumn periods. Per SNH (2019) guidance, static units (Song Meter SM4BAT and

SM-Mini) were programmed to commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late are recorded. Detectors were left out for a minimum of 10 consecutive nights across four survey periods. See **Appendix 6.2** for full details and **Plate 6.1** for locations of detectors.

SNH (2021) guidance states that "*Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines. Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments*".

In 2022, twenty-one detectors were deployed throughout the site based on an original proposal of 43 turbines (see **Plate 1**). The placement of detectors was split between habitats surrounding turbines (within 100 m) and location. Originally, 17 turbines were proposed within peat habitats, 12 in grassland and 11 in conifer plantation. Based on this, 9 detectors were placed in peatland, 6 in grassland and 7 in conifer plantation.

Many of these turbine locations were later revised or removed from the scope of the application. As of 2026, turbine locations have changed and 9 turbines are placed within conifer plantation, 6 within grassland and 1 located in a pre-existing quarry.

A fresh round of static monitoring was conducted in spring of 2026 aiming to verify that the landscape for bats remained similar, and to provide more accurate location-based data with multiple statics placed at the final turbine locations.

The data were analysed with Wildlife Acoustic's Kaleidoscope Pro; version 5.6.8). This software identifies many of the calls made by Irish bats. All calls were manually verified.

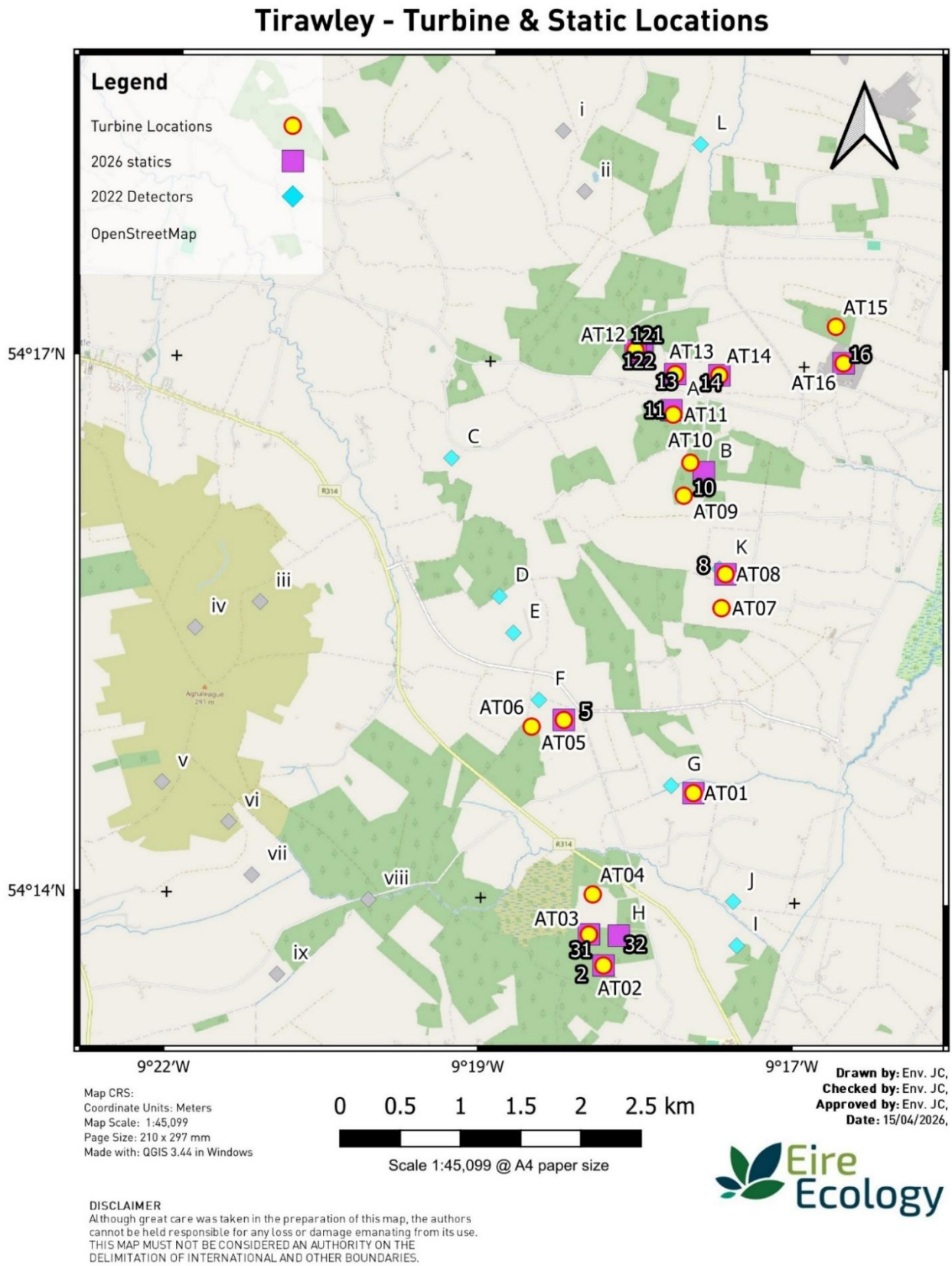

Plate 6.1: Locations of static detectors for bat surveys.

Potential roost assessment

The only existing buildings proposed to be impacted by the development are an unoccupied dwelling (proposed operations building 54.2789319, -9.3035854) and farm sheds proposed as temporary site compounds (54.2784558, -9.3031924). In addition, a number of linear features including small portions of hedgerow, conifer plantation and scrub will be removed to allow for the construction of access tracks and turbines.

Inspection of structures and ground level assessment of trees was undertaken in June 2022, March 2023, February 2024, June 2024 and April 2026 to evaluate the potential their potential to host bat roosts.

Trees

Trees within 200 m of each turbine and along Site Access Tracks (where the potential exists for felling) were examined for potential to host bat roosts on 8th to 9th March 2023 and on 14th to 15th February 2024, following guidelines set out in the Bat Tree Habitat Key (Andrews, 2016) and BCT Guidelines for professional ecologists.

All trees were assessed from ground level using binoculars.

Examples of crevice features include:

- Natural holes;
- Cracks/splits in major limbs;
- Loose bark; and
- Hollows/cavities.

Trees were categorized following Collins 2023 (Bat Surveys for Professional Ecologists: Good Practice Guidelines, 4th edition) (see **Table 6.3**).

Table 6.3: Tree category (after Collins, 2023).

Tree Category	Description
PRF	A tree with at least one potential roost feature (PRF)
FAR	Further assessment required to establish if PRF'S are present in the tree
None	Tree has no potential to support roosts

In total 273 trees (and hedge clusters) were surveyed from ground level for their potential to host individual bats or a maternity roost.

Structures

Structures thought to be of high potential for bat roosts were identified onsite during desktop review and preliminary roost assessment by surveyors. Primarily, surveyors focused on structures within 200 m plus blade radius (252 m) of each turbine. Given the number of changes to the project, several structures were examined, now outside the zone of influence of the development. In addition, multiple structures were examined in the wider landscape, along the grid route, and the TDR.

Bridges along the proposed GCR and TDR were assessed for bat roosting potential. Details on all buildings and bridges assessed are presented in **Appendix 6.2**.

6.2.7.4 Aquatic Ecology

Aquatic habitat surveys

Aquatic habitat surveys were conducted on all watercourses draining the proposed Wind Farm Site, and a total of 20 sites were selected for detailed assessment (see **Appendix 6.3**, **Table 1**). The locations of the 20 survey sites are shown in **Plate 6.2**. The surveys completed at each site were at a level required to make an evaluation of biological water quality, fisheries value, aquatic habitat value and the presence of rare/protected/notable aquatic species at each site. River habitat types, as well as flora and vegetation, were characterised at each survey site. The status of the watercourses surveyed was categorised on a scale of High-Good-Moderate-Poor-Bad.

Biological water quality

A biological water quality rating was assigned at each site following the methodology given in Toner *et al*., (2005). For the smaller streams the a "risk level" was given as described in the 'Small Stream Risk Score Method Manual' Anon (2005). This was a rapid assessment and estimated water quality ratings were assigned for each of the 20 aquatic survey sites. The SSRS categories are "Probably not at risk", "Probably at risk", and "At risk" of not meeting the Good Status requirements of the Water Framework Directive.

Plate 6.2: Locations of the September 2023 aquatic ecology survey sites.

Electrofishing surveys

The electrofishing survey was completed under authorisation from the Department of the Environment, Climate and Communications under Section 14 of the Fisheries (Consolidation) Act (1959).

Electrical fishing surveys were undertaken at 20 selected sites during September 2023, which is the optimal time for this type of a survey. The sites were surveyed following the methodology outlined in the CFB (2008) guidance "*Methods for the Water Framework Directive-Electric fishing in wadable reaches*" and had regard to Matson *et al.*, (2018). A portable electrical fishing unit (Smith Root-LR 24backpack) was used to carry out the survey. The sites were fished continuously for 10 minutes each. Juvenile Lamprey surveys were completed following the methodology for ammocoete surveys given in the manual *'Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri* and *Petromyzon marinus'* by Harvey & Cowx (2003).

Captured fish were collected into a container of river water using dip nets. The fish were released alive and spread evenly over the sampling area. Strict biosecurity measures were followed during all fieldwork (IFI, 2010).

Rare species surveys

During the course of the survey the possible presence of rare/notable species including Freshwater Pearl Mussel (*Margaritifera margaritifera*) and White-clawed crayfish (*Austropotamobius pallipes*) was fully considered. Crayfish, if present, will be detected during electrofishing surveys. A Phase 1 Freshwater Pearl Mussel survey (presence/absence) survey was completed at each site. At the majority of the sites the presence of mussels was ruled out based on the habitats present. Surveying for Freshwater Pearl Mussel (FPM) was carried out under license (NPWS License No. C46/2023) following the NPWS guidance *'Margaritifera margaritifera Stage 1 and Stage 2 survey guidelines'* (Anon, 2004).

6.2.7.5 Marsh Fritillary

An assessment of the status of the food plant (devil's-bit scabious *Succissa pratensis*) of marsh fritillary *Euphydryas aurinia* was carried out at the time of the botanical survey of the site. This was in accordance with the following:

"Ireland's Butterfly Series: Habitat management for the Marsh Fritillary" (Phelan *et al.* 2021) – in this reference, the following is noted:

Habitats that are in good condition for Marsh Fritillary should have three or more well-developed Devil's-bit Scabious plants per square metre, across more than twenty percent of the habitat.

"Ireland's Butterflies: A Review" (Nash *et al.* 2012), in this reference, for marsh fritillary the following is noted (pg. 186):

"All 'good sites' should have a very substantial amount of Devil's- bit Scabious."

6.2.7.6 *Survey Limitations*

The information provided in this assessment accurately describes the baseline ecological environment within the area of the Wind Farm Site.

The specialist surveys, analysis and reporting have been undertaken in accordance with the appropriate guidelines and within the recommended seasonal time periods.

As the site surveys for terrestrial ecology, including ornithology, commenced in summer 2021 and were largely concluded in winter 2023/24, the survey data are approaching 3 years of age or are now more than 3 years of age (with reference to the CIEEM Advice Note "*On the Lifespan of Ecological Reports & Surveys*", April 2019). An appraisal of the lifespan of the survey data in the context of assessing impacts by the Proposed Development is presented in **Appendix 6.5**.

It is considered that the assessment as carried out on the baseline survey data provides an accurate prediction of the likely ecological effects of the proposed Tirawley Wind Farm, prescribes best practice and mitigation as necessary (including monitoring), and describes accurately the residual ecological impacts. It is noted that should pre-construction surveys indicate a requirement for protection of relevant species, appropriate measures (as described in **Section 6.9**) will be taken to comply with all relevant legislation and best practice.

6.2.8 Assessment Approach

The ecological evaluation approach used in this report is based on "Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009a). The impact assessment approach is based on "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA 2022).

6.2.8.1 Key ecological receptors

Ecological receptors can be important for a variety of reasons and the rationale used to identify them is explained in the text. Importance may relate, for example, to the quality or extent of the Wind Farm Site or habitats therein; habitat and/ or species rarity; the extent to which such habitats and/ or species are threatened throughout their range, or to their rate of decline.

6.2.8.2 Determining importance of ecological receptors

The importance of an ecological receptor is considered within a defined geographical context. The following frame of reference has been used in this case (based on NRA Guidance 2009), relying on known/ published accounts of distribution and rarity where available, and professional experience:

- International and European
- National
- County
- Local Importance (higher value)
- Local Importance (lower value)

The above frame of reference is applied to the ecological receptors identified during the desk study and baseline surveys to inform this report.

The value of habitats and flora has been measured against published selection criteria where available. Examples of relevant criteria include habitats listed on Annex 1 of the Habitats Directive as amended and flora species listed on the Flora (Protection) Order 2022 or on the Irish Red List (Curtis & McGough 1988).

In assigning a level of value to a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available. Examples of relevant lists and criteria include: species of European conservation importance (as listed on Annexes II, IV and V of the Habitats Directive (as amended) or Annex 1 of the Birds Directive (as amended)), Birds of Conservation Concern in Ireland, species protected under the Wildlife Acts as amended etc.

For the purposes of this report ecological receptors of Local importance or greater, and/or subject to legal protection, have been subject to detailed assessment. Effects on ecological

receptors rated Local Importance (lower value) are considered unlikely to be significant in legal or policy terms.

6.2.8.3 Characterisation of Impacts and Effects

The impact assessment process involves the following steps:

- identifying and characterising potential impacts;
- incorporating measures to avoid and mitigate (reduce) these impacts;
- assessing the significance of any residual effects after mitigation;
- identifying appropriate compensation measures to offset significant residual effects (if required); and
- identifying opportunities for ecological enhancement.

When describing impacts, reference has been made to the following characteristics, as appropriate (in accordance with EPA 2022):

- Positive or negative;
- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and
- Reversibility.

The impact assessment process considers both direct and indirect impacts: direct ecological impacts are changes that are directly attributable to a defined action, e.g., the physical loss of habitat during the construction process. Indirect ecological impacts are attributable to an action but which affect ecological resources through effects on an intermediary habitat process or feature, *e.g.* the construction of a Site Access Track which causes local hydrological changes, which, in the absence of mitigation, could lead to the drying out of peat bog.

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

6.2.8.4 *Significant Effects*

The concept of ecological significance is addressed in paragraphs 5.24 through to 5.28 of CIEEM guidelines. Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of ecological impact assessment, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific, *e.g.* for a designated site, or broad, *e.g.* national/local nature conservation policy, or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local and the scale of significance of an effect may or may not be the same as the geographic context in which the feature is considered important.

The EPA Guidelines on information to be included in Environmental Impact Assessment Reports (EPA 2022) were adhered to when determining significance and the present assessment is in accordance with those guidelines. Details of the EPA Guidelines, including the criteria used for determining the significance of effects, are presented in **Chapter 1: Introduction.**

6.2.8.5 *Cumulative Effects*

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects can occur where a proposed development results in individually insignificant impacts that, when considered in-combination with impacts of other proposed or permitted plans and projects, can result in significant effects.

6.2.8.6 *Avoidance, Mitigation, Compensation and Enhancement*

When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a county scale should ensure no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

Where potentially significant effects have been identified, the mitigation hierarchy has been applied, as recommended in the EPA (2022) and CIEEM (2024) Guidelines. The mitigation hierarchy sets out a sequential approach beginning with the avoidance of impacts where possible, the application of mitigation measures to minimise unavoidable impacts and then compensation for any remaining impacts. Once avoidance and mitigation measures have

been applied residual effects are then identified along with any necessary compensation measures, and incorporation of opportunities for enhancement.

It is important for the impact assessment to clearly differentiate between avoidance mitigation, compensation and enhancement and these terms are defined here as follows:

- Avoidance is used where an impact has been avoided, e.g. through changes in scheme design;
- Mitigation is used to refer to measures to reduce or remedy a specific negative impact *in situ*;
- Compensation describes measures taken to offset residual effects, i.e. where mitigation *in situ* is not possible.
- Enhancement is improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which may be unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact.

6.3 BASELINE ECOLOGICAL CONDITIONS

6.3.1 Physical and General Ecological Description of Site

The Proposed Development is located approximately 5.2 km northwest of the village of Killala and approximately 4 km east-southeast of Ballycastle village in north Mayo (see **Chapter 1: Figure 1.2**). The Redline Boundary of the Wind Farm Site covers a total area of approximately 108.06 ha. The Wind Farm Site, including the GCR, is situated within a large number of townlands (see **Chapter 2**: **Development Description**). The Wind Farm Site is accessed via local public roads which branch off from the R314.

The Wind Farm Site, and especially the northern sector, is situated within a landscape which previously had been dominated by blanket bog and heath. Much of this has now been cut or converted to pasture grassland used for grazing cattle and sheep, with fields often small in size and bounded by hedgerows. Commercial coniferous forestry is a feature of the area. There are no significant industrial or commercial facilities or operational wind farms in the immediate vicinity of the site for the Wind Farm.

The elevations within the Wind Farm Site range from approximately 20 m to 155 m OD. The highest elevations are in the north of the Wind Farm Site on the southern and eastern slopes of Knockboha Hill (peak of 186 m OD). A further high point of 137 m occurs in the central area (Barnhill). The southern section of the Wind Farm Site is located on lower ground with topography sloping gently to the southeast towards Cloonaghmore Estuary and Killala Bay.

The bedrock geology underlying the Wind Farm Site is mapped predominantly as Dinantian Sandstones, Shales and Limestones of the Downpatrick Formation (see details in **Chapter 8: Soils and Geology**). The OSI Online Database indicates that Peat (Blanket Bog) is the primary soil type present across the site of the Wind Farm, which overlies Glacial Till derived from Sandstones and Limestones, with Alluvium in river valley bottoms. The majority of the peat covering the Redline Boundary area of the site is shallow with a depth of less than 0.5m.

On a regional scale, the Wind Farm Site is located in the Blacksod-Broadhaven Bay surface water catchment within Hydrometric Area 33 of the Western River Basin District (for details of drainage see **Chapter 9: Hydrology and Hydrogeology).** Locally the Wind Farm Site is mapped in 2 no. WFD river sub-basins:

- The majority of the Wind Farm Site is located in the Cloonalaghan_010 river sub-basin. This area is drained by the Carn River and several 1st and 2nd order streams all of which discharge into the Cloonalaghan River, which flows in a northeast direction before discharging into Lackan Bay.
- The northeast of the Wind Farm Site is located in the Knockboha_010 river sub-basin. This area of the Wind Farm Site is drained by several 1st order streams which flow downslopes to the east into Lacken Strand. The watercourses in the vicinity of the Wind Farm Site are locally unnamed and are referred to by the EPA as the Castletown stream. This watercourse is mapped to originate ~250 m northeast of wind turbine AT17.

Ecologically, the area in which the Wind Farm Site is located, is dominated by agricultural grassland which varies from Improved agricultural grassland (GA1) to Wet grassland (GS4) depending on intensity of management. Much of the grassland is best described as a semi-improved sward. The fields are mostly bounded by Hedgerows (WL1), which are typically of a low stature. Conifer plantation (WD4) is a main habitat in the area and especially in the southwest sector. Intact Lowland blanket bog (PB3) is now scarce in the area of the Wind Farm, though some relatively intact blanket bog remnants, as well as Cutover bog (PB4), occurs in the northern (Lackanhill) and north-central sectors (Cloonanass-Lissadrone). It is noted that more extensive blanket bog occurs on Knockboha Hill outside of the Wind Farm study area, as well on the extensive plateau area between the R314 and R315 roads to the south of Ballycastle. The watercourses within the study site, which are described in detail in the **Aquatic Ecology Assessment** (**Appendix 6.3**) and in **Chapter 9: Hydrology and Hydrogeology**, are classified mainly as Depositing/lowland rivers (FW2). Drainage ditches (FW) are associated with most of the pasture fields. Other habitats which occur over small

areas are Broadleaved woodland (WD1), Scrub (WS1), Disturbed ground (ED) (including disused quarry), and Buildings and artificial surfaces (BL3).

The Grid Connection, which extends over a length of 13.55 km, is almost entirely along public roads (BL3). The roads typically are lined with low hedgerows (WL1) and grassy verges (GS2).

The options for the TDRs, from the port of Killybegs, Co. Donegal, from Galway Port, Co. Galway, and from Foynes, Co. Limerick are almost entirely along existing public roads (BL3).

From a wider conservation perspective, the Killala Bay system is the dominant feature of the local area. Much of the inner bay, including the Rathfran Bay inlet, is designated as an SAC and an SPA, as is Lackan Bay to the northwest of Killala Bay. Further to the west of the Wind Farm Site, extensive expanses of blanket bog become a feature of the landscape.

6.3.2 Designated Sites

The potential for the Proposed Development to impact on sites that are designated for nature conservation is considered in this Ecological Impact Assessment.

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated under the EU Habitats Directive as amended and EU Birds Directive as amended respectively and are collectively known as 'European Sites'. The potential for significant effects on the integrity of European Sites is fully assessed in the Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) that accompanies this application. As per EPA Guidance 2022, *"a biodiversity section of an EIAR, for example, should not repeat the detailed assessment of potential effects on European sites contained in documentation prepared as part of the Appropriate Assessment process, but it should refer to the findings of that separate assessment in the context of likely significant effects on the environment, as required by the EIA Directive".* **Section 6.4.2** of this EIAR provides a summary of the key assessment findings with regard to European Designated Sites.

Natural Heritage Areas (NHAs) are designated under Section 18 the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. The potential for effects on these designated sites is fully considered in this Ecological Impact Assessment (EcIA).

Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. However, the potential for effects on these sites is fully considered in this EcIA.

All designated sites that could potentially be affected were identified using a source-pathway – receptor model. To provide context for the assessment, European and national sites within a distance of 15 km surrounding the Wind Farm Site have been considered and are shown in **Figures 6.1** and **6.2** in **Vol III** of the **EIAR** respectively. The distance of 15 km follows guidance from the Department of Environment, Heritage and Local Government (2010). However, sites that were further away from the Proposed Development were also considered and especially where there is possible hydrological connectivity. Information on the identified sites according to the site-specific conservation objectives (as available) is provided in **Tables 6.3** and **6.4**.

It is noted that no part of the Proposed Development area is within a site with a nature conservation designation.

6.3.2.1 European designated sites

A total of seven European designated sites occurs within a 15 km distance of the Wind Farm Site (see **Figure 6.1**). These are listed in **Table 6.4**, along with the reasons for designation, the distance from the Proposed Development and whether any linkages or connectivity exist between the two locations.

The nearest designated European site to the Wind Farm Site is the Lackan Saltmarsh and Kilcummin Head SAC and the Lackan Bay component of the Killala Bay/Moy Estuary SPA (both just over 1 km distance from northern-easternmost sector of the Wind Farm Site), with hydrological connectivity between the two locations. The Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA receive drainage from the route of the Grid Connection and from the sector of the TDR extending form Ballina to the Wind Farm Site.

For the other listed European sites, there is no ecological or hydrological connectivity with any component of the site for the proposed Wind Farm. The European sites are considered in detail in the AA Screening Report and NIS which accompany this application.

6.3.2.2 Natural Heritage Areas

There are three Natural Heritage Areas (NHAs) within the 15 km radius of the Wind Farm Site (see **Figure 6.2**). These are blanket bog sites, namely Forrew Bog NHA, Inagh Bog NHA and Ummerantarry Bog NHA.

There is no ecological or hydrological connectivity between these three NHAs and the Proposed Development.

6.3.2.3 Proposed Natural Heritage Areas

A total of ten proposed Natural Heritage Areas (pNHAs) occurs within a 15 km radius of the Wind Farm Site (see **Figure 6.2** in Vol III and **Table 6.5**). Proposed Natural Heritage Areas are sites of ecological interest though specific qualifying habitats or species have not as of yet been identified by NPWS.

Five of the pNHAs are also designated as SACs and/or SPAs, namely Lackan Saltmarsh and Kilcummin Head, Killala Bay/Moy Estuary, Lough Conn and Lough Cullin, Bellacorick Bog Complex, and Glenamoy Bog Complex. Potential impacts on these five sites are discussed in detail in the accompanying AA Screening Report and NIS.

For the remaining five listed pNHA sites, there is no ecological or hydrological connectivity with the Proposed Development.

Table 6.4: Relevant European sites, reasons for designation, distances from Project Area and summary of connectivity.

European Site	Reasons for designation (information correct as of 7th April 2026) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	SPECIAL AREAS OF CONSERVATION	
Lackan Saltmarsh and Kilcummin Bay SAC (site code 00516)	Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] *Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] According to this SAC's site Conservation Objectives document: NPWS (22 Dec 2016) Conservation Objectives: Lackan Saltmarsh and Kilcummin Head SAC, Version 1.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, for each of the listed QIs, the Conservation Objective is to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.	The north-easternmost sector of the Proposed Development is approximately 1.2 km from the SAC (closest straight-line distance). There is no ecological continuity between the two locations. The Wind Farm Site is hydrologically connected with Lackan Bay via the Cloonalaghan River and several other small watercourses which drain the east of the site. It is concluded that there is hydrological connectivity between the Wind Farm Site and the SAC. There is no connectivity between the GCR and the SAC or the TDR and the SAC.
Killala Bay / Moy Estuary SAC (site code: 00458)	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] 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] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	The Wind Farm Site is (at closest straight-line distance) approximately 4.0 km west-northwest of the SAC. There is no ecological or hydrological connectivity between the Wind Farm Site and the SAC. The GCR is hydrologically linked with the SAC via the Cloonaghmore River. The TDR is not hydrologically linked with the SAC. It is concluded that there is hydrological connectivity between the Grid Connection component of the Project and the SAC.

European Site	Reasons for designation (information correct as of 7th April 2026) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	*Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] Vertigo angustior (Narrow-mouthed Whorl Snail) [1014] Petromyzon marinus (Sea Lamprey) [1095] Phoca vitulina (Harbour Seal) [1365] According to this SAC's site Conservation Objectives document: NPWS (2012), Conservation Objectives for Killala Bay/Moy Estuary SAC [00458]. Version 1.0. Department of Arts, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	
River Moy SAC (site code: 002298)	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) [6510] *Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150] Alkaline fens [7230] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355] According to this SAC's site Conservation Objectives document: NPWS (2016): Conservation Objectives: River Moy SAC, Version 1. Department of Arts, Heritage,	The Wind Farm Site is located approximately 11 km north of the SAC. There is no ecological or hydrological connectivity between the Wind Farm Site and the SAC. The GCR is not hydrologically linked to the River Moy SAC. The TDR is not hydrologically linked to the River Moy SAC. It is concluded that there is no ecological or hydrological connectivity between any aspect of the Project and the River Moy SAC.

European Site	Reasons for designation (information correct as of 7th April 2026) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	Regional, Rural and Gaeltacht Affairs, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	
Bellacorick Bog Complex SAC (site code: 001972)	Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with Erica tetralix [4010] Blanket bogs (* if active bog) [7130] Depressions on peat substrates of the Rhynchosporion [7150] Alkaline fens [7230] Vertigo geyeri (Geyer's Whorl Snail) [1013] Saxifraga hirculus (Marsh Saxifrage) [1528] According to this SAC's site Conservation Objectives document: NPWS (6 Oct 2017), Conservation Objectives for Bellacorick Bog Complex SAC [001922]. Version 1.0. Department of Culture, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	The Wind Farm Site is approximately 7 km northeast of the SAC. There are no ecological or hydrological linkages between the Wind Farm Project area, including the GCR and the TDR and the SAC. It is concluded that there is no ecological or hydrological connectivity between Wind Farm Project Area and the SAC.
Glenamoy Bog Complex SAC (site code: 00500)	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Machairs (* in Ireland) [21A0] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with Erica tetralix [4010] Juniperus communis formations on heaths or calcareous grasslands [5130] Blanket bogs (* if active bog) [7130] Transition mires and quaking bogs [7140] Depressions on peat substrates of the Rhynchosporion [7150]	The Wind Farm Site is approximately 4 km east of the nearest sector of the SAC (namely the bog outlier along the Owenpollaphuca River). There are no ecological or hydrological linkages between the Wind Farm Project area, including the GCR and the TDR and the SAC. It is concluded that there is no ecological or hydrological connectivity between Wind Farm Project Area and the SAC.

European Site	Reasons for designation (information correct as of 7th April 2026) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	Salmo salar (Salmon) [1106] Petalophyllum ralfsii (Petalwort) [1395] Saxifraga hirculus (Marsh Saxifrage) [1528] Hamatocaulis vernicosus (Slender Green Feather-moss) [6216] According to this SAC's site Conservation Objectives document: NPWS (30 June 2017), Conservation Objectives for Glenamoy Bog Complex SAC [00500]. Version 1.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	
	SPECIAL PROTECTION AREAS	
Killala Bay / Moy Estuary SPA (site code: 004036)	Ringed Plover (Charadrius hiaticula) [A137] Golden Plover (Pluvialis apricaria) [A140] Grey Plover (Pluvialis squatarola) [A141] Sanderling (Calidris alba) [A144] Dunlin (Calidris alpina) [A149] Bar-tailed Godwit (Limosa lapponica) [A157] Curlew (Numenius arquata) [A160] Redshank (Tringa totanus) [A162] Wetland and Waterbirds [A999] According to this SPA's site Conservation Objectives document: NPWS 2013, Conservation Objectives: Killala Bay/Moy Estuary SPA 004036. Version 1.0, Department of Arts, Heritage, and the Gaeltacht, for each of the listed SCIs, the Conservation Objective is to maintain the favourable conservation condition of the species for which the SPA has been selected.	The Wind Farm Site is just over 1 km from the Lackan Bay and Rathfarn Bay inlets of the SPA. Between the northernmost sector of the Wind Farm Site and the SPA there is degraded blanket bog and pasture fields, mostly wet grassland, which provides a low level of ecological continuity between the two locations. Some of the habitats within the wind farm site, i.e. improved/semi-improved grassland and wet grassland, potentially provide habitat for inland feeding wader species (golden plover & curlew) associated with the SPA. The Wind Farm Site is hydrologically connected with Lackan Bay via the Cloonalaghan River and several other small watercourses which drain the east of the site. The GCR is hydrologically linked with the SPA via the Cloonaghmore River. It is concluded that there is ecological and hydrological connectivity between the Wind Farm Site and the SPA, and hydrological connectivity between the GCR and the SPA.

European Site	Reasons for designation (information correct as of 7th April 2026) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
Lough Conn and Lough Cullin SPA (site code: 004228)	Tufted Duck (Aythya fuligula) [A061] Common Scoter (Melanitta nigra) [A065] Common Gull (Larus canus) [A182] Greenland White-fronted Goose (Anser albifrons flavirostris) [A395] Wetland and Waterbirds [A999] According to this SPA's site Conservation Objectives document: NPWS 2025, Conservation Objectives: Lough Conn and Lough Cullin SPA 004228. Version 1.0, Department of Housing, Local Government and Heritage, for each of the listed SCIs, the Conservation Objective is to maintain the favourable conservation condition of the species for which the SPA has been selected. In recognition of wetland habitat, the Conservation Objective is: To maintain or restore the favourable conservation condition of the wetland habitat at Lough Conn and Lough Cullin SPA as a resource for the regularly occurring migratory waterbirds that utilise it	The Wind Farm Site is approximately 14 km north of the northernmost sector of the SPA. There are no ecological or hydrological linkages between the Wind Farm Project area, including the GCR and the TDR, and the SPA. The Lough Conn population of Greenland white-fronted geese feeds mainly on grassland within (islands) and around the lake. One feeding site on blanket bog is known within the Ox Mountains (Fox et al. 1994). There are no known or historic feeding sites northwards towards Killalla or Ballycastle. Lough Conn is selected for breeding common scoter. The most recent national survey in 2020 recorded 1 pair on Lough/Cullin (Hunt et al. 2022). In winter, common scoter occurs in shallow waters less than 20 m deep, with coarse sandy substrates, where they feed predominantly on benthic bivalve molluscs. They tend to congregate in large flocks (hundreds to low thousands). Donegal Bay supports the largest winter population in the north-west region. In County Mayo, the largest flock occurs in Blacksod and Broadhaven bays (Crowe 2005). There are no regular winter flocks off the north Mayo coast. It is concluded that there is no ecological or hydrological connectivity between Wind Farm Project Area and the SPA.

Table 6.5: Relevant Natural Heritage Areas and proposed Natural Heritage Areas, reasons for designation (if known), distances from Tirawley Wind Farm Site and summary of connectivity.

Site	Reasons for designation (information correct as of 5th September 2025)	Distance from Tirawley Wind Farm Site and summary of connectivity
NATURAL HERITAGE AREAS		
Forrew Bog NHA (site code 002432)	Peatlands (4)	The NHA is located approximately 8 km southwest of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the NHA.
Inagh Bog NHA (site code: 002391)	Peatlands (4)	The NHA is located approximately 11 km west of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the NHA.
Ummerantarry Bog NHA (site code: 001570	Peatlands (4)	The NHA is located approximately 8.5 km west-southwest of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the NHA.
PROPOSED NATURAL HERITAGE AREAS		
Downpatrick Head pNHA (site code: 00494)	Not stated but supports sea cliffs and breeding seabirds	The pNHA is located just over 5 km north-northwest of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the pNHA.
Creevagh Head pNHA (site code: 00482)	Not stated but supports sea cliffs and breeding seabirds	The pNHA is located approximately 3 km north-northeast of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the pNHA.
Lacken Saltmarsh and Kilcummin Head pNHA (site code 00516)	Not stated but presumed similar to SAC & SPA (see **Table 6.3**)	As in **Table 6.3** above.

Site	Reasons for designation (information correct as of 5th September 2025)	Distance from Tirawley Wind Farm Site and summary of connectivity
Killala Bay/Moy Estuary pNHA (site code: 00458)	Not stated but presumed similar to SAC & SPA (see **Table 6.3**)	As in **Table 6.3** above.
Killala Esker pNHA (site code: 001517)	Not stated but presumed grassland and/or woodland	The pNHA is located just over 4 km southeast of the Wind Farm Site. There is no ecological or hydrological connectivity between the Wind Farm Project area, including the GCR and TDR, and the pNHA.
Cloonagh Lough pNHA (site code: 001485)	Not stated but supports various wetland habitats	The pNHA is located approximately 11 km southeast of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the pNHA.
Lough Conn and Lough Cullin pNHA (site code 00519)	Not stated but presumed similar to SPA (see **Table 6.3**)	As in **Table 6.3** above.
Bellacorick Bog Complex pNHA (site code: 001922)	Not stated but presumed similar to SAC (see **Table 6.3**)	As in **Table 6.3** above.
Glenamoy Bog Complex pNHA (site code: 00500)	Not stated but presumed similar to SAC & SPA (see **Table 6.3**)	As in **Table 6.3** above.
Benedereen Cliffs pNHA (site code:00467)	Not stated but supports sea cliffs and breeding seabirds.	The pNHA is located just over 9 km west-northwest of the Wind Farm Site. There is no ecological or hydrological connectivity between the Proposed Development Site and the pNHA.

6.3.3 Habitats, Vegetation and Flora

As already noted, the dominant habitats within the Wind Farm Site are improved agricultural grassland (GA1), wet grassland (GS4), and conifer plantation (WD4). On the ground, a gradient from improved grassland to wet grassland often exists, reflecting the intensity of management in any one season. Generally, much of the grassland within the study area could be referred to as 'semi-improved'. If left unmanaged, the grassland sward will become dominated by rushes (wet grassland) over a relatively short space of time. Hedgerows (WL1) typically form the boundaries of the fields and are often in association with Drainage ditches (FW4). Areas of relatively intact Lowland blanket bog (PB3) occur at the location of wind turbine AT13 at Lackan Hill and also adjoining the abandoned quarry at Castlelackan Demesne (location for AT16). Scrub occurs scattered throughout, with stands of Broadleaved woodland (WD1) occasional. Other habitats which occur over small areas are Disturbed ground (ED) (including abandoned quarry), and Buildings and artificial surfaces (BL3) (including public roads). The watercourses within the study site are described in detail in the **Aquatic Ecology Assessment** (**Appendix 6.3**), as well as in **Chapter 9: Hydrology and Hydrogeology**.

There follows general descriptions of the habitats within the Redline Boundary and then a summary of the principal habitat(s) at each turbine location as well as at the other main infrastructure locations (met mast, substation, operations building etc.). Habitat descriptions for the GCR and the section of TDR from Ballina to the Wind Farm Site are given separately. As the majority of the area within the Redline Boundary is grassland and/or conifer plantation scattered over a relatively large area (straight-line distance of almost 6 km from southernmost turbine AT02 to northernmost turbine AT15), habitat maps are presented only for the occurrence of natural or semi-natural habitats, such as blanket bog or woodland. Species lists for main habitats are given in **Appendix 6.1.**

6.3.3.1 Improved agricultural grassland (GA1)

Much of the agricultural grassland within the study area is best described as a semi-improved sward, which often grades to wet grassland depending on drainage, underlying soil type and recent management. Rushes, mainly soft rush *Juncus effusus*, are a feature of most fields and even in the better managed swards may attain a coverage of 50% or even more. Cattle and sheep are the main stock animals.

Widespread grass species include common bent *Agrostis capillaris*, perennial rye grass *Lolium perenne,* Yorkshire fog *Holcus lanatus*, meadow grass (*Poa* spp.) and sweet vernal grass *Anthoxanthus odoratum.*

Herbaceous species present include white clover *Trifolium repens*, ribwort plantain *Plantago lanceolata*, creeping buttercup *Ranunculus repens*, meadow buttercup *Ranunculus acris*, creeping thistle *Cirisum arvense,* self-heal *Prunella vulgaris*, common sorrel *Rumex acetosa*, daisy *Bellis perennis,* dandelion *Taraxacum officinale* and common mouse-ear *Cerastium fontanum.*

Plate 6.3: Improved grassland is a widespread habitat within the study area - view is at the location for the proposed substation, looking northwards. This sward has low rush cover and is an example of a better managed sward (February 2024).

Plate 6.4 a: Much of the grassland within the study area is best described as semi-improved, with often a high cover of rushes. This at the location for AT02 (February 2024).

Plate 6.4 b: View is of a further example of semi-improved grassland, with a scattering of rushes. The is at the location for AT14 (February 2024).

6.3.3.2 Wet grassland (GS4)

Wet grassland is characterised by a high frequency of rushes, often in excess of 70% coverage. Along with soft rush, bulbous rush *Juncus bulbosus* is a frequent species, along with small sedges such as *Carex flacca* and *Carex panicea*. In former peatland areas, bog grasses such as purple moor grass *Molinia caerulea* may be present. Where the surface is wet, creeping bent *Agrostis stolonifera* is often present.

Frequent herbaceous species include creeping buttercup *Ranunculus repens*, marsh thistle *Cirsium palustre*, heath bedstraw *Galium saxatile*, silverweed *Potentilla anserina*, cuckoo flower *Cardamine pratensis*, devil's-bit scabious *Succissa pratensis*, and cat's paw *Hydrochoeris radicata*. In very wet sectors, meadow sweet *Filipendula ulmaria*, water mint *Mentha aquatica* and lesser spearwort *Ranunculus flammula*, as well as yellow iris *Iris pseudacorus*, are often found. Mosses are a feature of wet grassland swards, with frequent species such as *Hylocomium splendens*, *Hynum jutlandicum*, *Polytrichum commune,* and *Rhytidiadelphus squarrosus*.

Plate 6.5: Wet grassland is a frequent habitat within the study area, with some fields totally dominated by rushes - view is in area of AT08 (February 2024).

Plate 6.6: View of wet grassland sward with high rush cover at proposed location for AT02, (February 2024).

6.3.3.3 Dry meadows and grassy verges (GS2)

Unmanaged grassland, classified as Dry meadows and grassy verges, occurs along road margins throughout the study area.

The grassland verges along roads are typically rank swards and dominated by widespread plant species including creeping buttercup *Ranunculus repens*, white clover Trifolium repens, red clover *Trifolium pratense*, narrow leaved-plantain *Plantago lanceolata*, self-heal *Prunella vulgaris*, bush vetch *Vicia sepium*, meadow vetchling *Lathyrus pratensis*, common mouse-ear *Cerastium fontanum*, yarrow *Achillea millefolium*, common knapweed *Centaurea nigra*, meadowsweet *Filipendula ulmaria*, wild angelica *Angelica sylvestris*, silverweed *Potentilla anserina*, common nettle *Urtica dioica*, as well as common grass species such as *Deschampsia flexuosa*, *Holcus lanatus* and *Dactylis glomerata*. Coarser species, such as thistles (*Cirsium spp.),* docks (*Rumex spp*.), ragwort *Jacobea vulgaris* and nettle *Urtica dioica*, are also present in the sward.

Meadow grassland in association with gorse/bramble scrub is also represented in the southernmost part of the abandoned quarry at Castlelackan Demesne.

6.3.3.4 Lowland blanket bog (PB3)

The location for the proposed turbine AT13 comprises hummocky lowland blanket bog (PB3) vegetation on peat soil, which generally varies between 50 cm and 1 metre in depth (see **Plates 6.7** & **6.8**). The dominant species in the vegetation are ling *Calluna vulgaris* and hare's tail bog cotton *Eriophorum vaginatum,* with frequent cross-leaved heath *Erica tetralix,* bog asphodel *Narthecium ossifragum,* deer grass *Trichophorum germanicum* and purple moor-grass *Molinia caerulea*. Other species present include carnation sedge *Carex panicea*, round leaved sundew *Drosera rotundifolia*, common bog cotton *Eriophorum angustifolium*, tormentil *Potentilla erecta*, and heath milkwort *Polygala vulgaris*.

The bryophyte layer is dominated by *Sphagnum capillifolium, Sphagnum cuspidatum* and *Cladonia portentosa*. The cover of Sphagnum moss is generally between 30 % and 60 %. Although the peat depth in this area is relatively shallow for blanket bog, indicating that the area may have been modified in the past through cutting or overgrazing, the vegetation present is dominated by peat-forming species indicative of active blanket bog growth.

To the north of the proposed wind turbine AT13 location the main habitat is poor flush (PF2) the vegetation of which is dominated by a mixture of *Molinia caerulea, Juncus acutiflorus* and *Juncus effusus*. The main moss in this habitat is *Pseudoscleropodium purum* with *Hylocomium splendens* also frequent. Sphagnum cover is generally less than 10%. Peat depths are relatively shallow, *i.e.* <50 cm, and it is likely that this habitat has developed in areas which were previously cut for turf in the past.

The small enclosed fields to the south of wind turbine AT13 location are dominated by a mosaic of blanket bog and wet heath on shallow peat with small areas of poor flush and scrub vegetation also occurring, while to the west tall wet grassland (GS4) dominated by *Juncus effusus* dominates.

The abandoned quarry at Castlelackan Demesne was constructed in an extensive area of blanket bog. Relatively intact blanket bog still remains within the Redline Boundary in undisturbed areas along the eastern and north-western margins of the quarry complex (see **Plates 6.9** & **6.10**). These bog areas are generally similar in species composition to that already described at the wind turbine AT13 location, with dominant species being *Eriophorum angustifolium, Molinia caerulea, Trichophorum germanicum, Cladonia portentosa* and *Racomitrium lanuginosum.* The bog mosses *Sphagnum capillifolium* and *S. papillosum* are frequent.

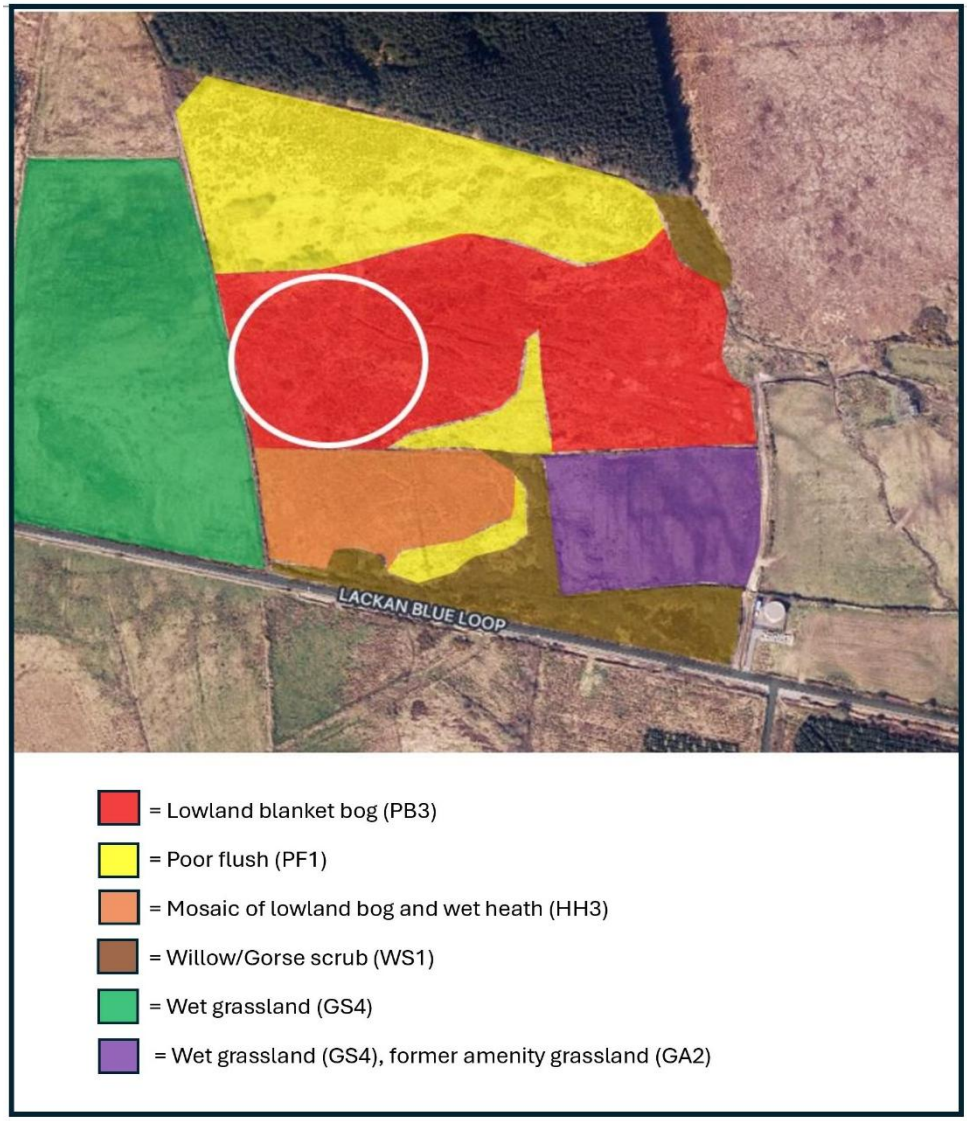

Plate 6.7: Habitats occurring in the vicinity of proposed AT13 location (white circle).

Plate 6.8: View of blanket bog at location for proposed turbine AT13 (September 2023).

Plate 6.9: View of blanket bog along eastern margin of abandoned quarry at Castlelackan Demesne (December 2023).

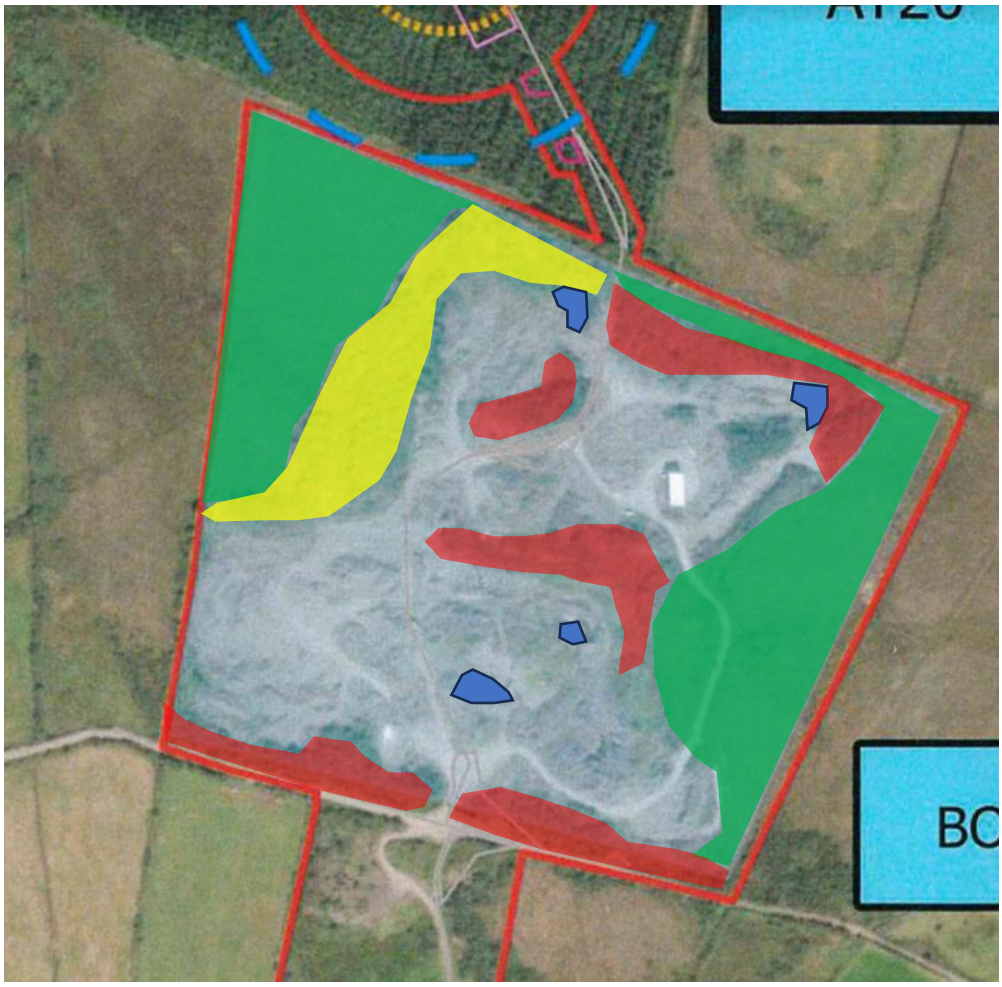

Plate 6.10: Aerial image of abandoned quarry at Castlelackan Demesne showing existing areas of blanket bog (green shading), tall willow scrub (yellow shading), low scrub (red shading) and ponds (blue shading).

6.3.3.5 Coniferous plantation (WD4)

Conifer plantation is a dominant habitat within the study area. The main tree species is sitka spruce *Picea sitchensis,* with lodgepole pine *Pinus contorta* and Japanese larch *Larix japonica* also present in smaller amounts. Some broadleaved trees have been planted, often along the margins of the conifer blocks, and include alder *Alnus glutinosa,* ash *Fraxinus excelsior* and birch *Betula* spp. Most of the plantations are now in the closed canopy stage (see **Plate 6.11**) and are of variable quality in terms of growth (see details in Forestry Report **Appendix 14.1**).

Plate 6.11: Conifer plantation is widespread within the study area. Sitka spruce is the principal tree species and is mostly in the mature phase (February 2024).

Plate 6.12: The ground layer of the conifer plantation is typically sparsely vegetated due to the shading effect from the trees. Drains (as in right of image) are a feature of the plantations, (February 2024).

Generally, the ground layer is species-poor, being dominated by conifer needles (see **Plate 6.12**) along with occasional clumps of mosses such as *Hypnum jutlandicum, Rhytidiadelphus loreus, Thuidium tamariscinum* and *Plagiothecium undulatum.* Vascular plant species have a very low cover, with bramble *Rubus fruticosus* and broad buckler fern *Dryopteris dilatata* the most widespread species. Where the conifer stands have been planted on former bog, ling heather and purple moor grass may still persist along the edges of the stands or along tracks or firebreaks through the forests.

6.3.3.6 Broadleaved woodland (WD1)

An area of mostly broadleaved woodland (WD1) occurs along the eastern side of the R314 between the proposed substation and the AT02-AT04 cluster of turbines. While the route for internal cabling will cross this woodland, the crossing will be by Horizontal Directional Drilling (HDD) and disturbance to the wood will not occur. However, for completeness, there follows a description of this woodland**.**

The stand of woodland is approximately 1 ha in area. The woodland is tall, i.e. >10 m, and is dominated by alder *Alnus glutinosa*, with occasional birch *Betula pubescens*, sycamore *Acer pseudoplatanus*, beech *Fagus sylvatica* and some grey willow *Salix cinerea* subsp. *oleifolia* and holly *Ilex aquifolium* (see **Plate 6.13**). There is also a small area of sitka spruce and occasional Lawson's cypress *Chamaecyparis lawsoniana* in the central part of the wood. The ground layer of the woodland is species-poor and is dominated by ivy *Hedera helix* and bramble *Rubus fruticosus,* with lesser celandine *Ranunculus ficaria*, lord's and ladies *Arum maculata*, wood sedge *Carex sylvatica*, herb Robert *Geranium robertianum*, and the fern species *Dryopteris dilatate, Dryopteris filix-mas* and *Phyllitis scolopendrium.* These species are generally indicative of dry soil conditions. Running through the centre of the woodland there is a tall earth embankment with a shallow, damp drain on either side, however wetland vegetation is not well developed.

Plate 6.13: View of interior of broadleaved woodland adjoining the R314 (December 2023).

6.3.3.7 Scrub (WS1)

An area of tall willow scrub occurs within the northwestern sector of the abandoned quarry at Castlelackan Demesne (see **Plate 6.10** and **Plate 6.14**). This is up to 5 m in height and dominated by grey willow *Salix cinerea* subsp. *oleifolia* and eared willow *Salix aurita.* Common gorse *Ulex europaeus* and bramble *Rubus fruticosus* are also represented. Scrub also occurs scattered throughout the quarry complex, mostly dominated by gorse and bramble.

Elsewhere within the study area scrub occurs in small patches, often associated with unmanaged hedges and can include gorse, blackthorn *Prunus spinosa* and bracken *Pteridium aquilinum*.

Plate 6.14: Tall scrub dominated by Willow in the western sector of the abandoned quarry at Castlelackan Demesne (April 2026).

6.3.3.8 Hedgerow (WL1)

Roadside hedgerows are frequent within the study area though are often poorly developed in terms of height and species diversity (see **Plates 6.15** & **6.16**). Most of the hedgerows are low-growing, *i.e.* 3 to 6 metres tall, with tree standards scarce. The main tree/shrub species are willow species, mostly grey willow *Salix cinerea* subsp. *oleifolia* and eared willow *Salix aurita,* hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa,* elder *Sambucus nigra* and ash *Fraxinus excelsior.* Other less common tree/shrub species include downy birch *Betula pubescens*, holly *Ilex aquifolium*, sycamore *Acer pseudoplatanus*, hazel *Corylus avellana,* and rowan *Sorbus aucuparia*. Some stretches of low hedge are dominated by gorse *Ulex europaeus*. Many of the ash trees, which comprise the principal tree standard, are affected by ash dieback disease.

Ivy *Hedera helix* is often frequent on the larger trees, with bramble a common component of the understorey and ground layers. Wild roses (*Rosa* spp.) and honeysuckle *Lonicera periclymenum* are a feature of the understorey.

Herbaceous species occurring within the ground layer include hogweed (*Heracleum sphondylium*), broadleaved dock *Rumex obtusifolius*, nettle *Urtica dioica,* bush vetch *Vicia*

sepium, cleavers *Galium aparine*, primrose *Primula vulgaris* and lords and ladies *Arum maculata*.

The non-native naturalised shrubs fuchsia and snowberry are occasional.

The hedgerows are typically laid on clay banks and are usually associated with a drainage ditch (as part of field boundary).

Plate 6.15: View of hedgerow along local road at location for proposed substation. Typically, the hedging along local roads is low and in places intermittent and dominated by willow, hawthorn and blackthorn (February 2024).

Plate 6.16: View of a more developed hedgerow, which includes sycamore and ash, though still dominated by willow (February 2024).

6.3.3.9 Watercourses (FW)

The rivers and streams within the study are described in detail in the Aquatic Ecology Assessment (**Appendix 6.3**). Some of these are fairly fast flowing systems (see **Plate 6.17**) and could be classified as Eroding/upland rivers (FW1), while other sections are slower flowing and would be considered as Depositing/lowland rivers (FW2).

The banks are generally lined, often intermittently, with hawthorn, blackthorn, alder and grey willow, along with soft rush, bracken and brambles.

Plate 6.17: View of a fast flowing section of the Carn River (December 2023).

6.3.3.10 Artificial lakes and ponds (FL8)

A number of small ponds have developed within the abandoned quarry at Castlelackan Demesne (see **Plate 6.10** & **Plate 6.18**). The ponds contain deep water, i.e. >2 metres deep, and have rocky margins and bottoms. These ponds probably have been created in the last few decades as a result of quarry excavations and thus the associated aquatic vegetation is species-poor. In the shallow water along the pond margins *Agrostis stolonifera, Juncus articulatus* and *Ranunculus flammula* are common growing on a thin mineral soil however true aquatic species are rare in the deep water areas of the ponds. In the two northern ponds there is some limited development of swamp vegetation along the margins dominated by bulrush *Typha latifolia*. The ponds provide useful habitat for amphibians.

Plate 6.18: View of a pond in northern sector of abandoned quarry at Castlelackan Demesne. Supports bulrushes and pondweeds, and the common frog (April 2026).

6.3.3.11 Spoil and bare ground (ED2) / Recolonising bare ground (ED3) / Active quarries and mines (ED4)

This mosaic of habitat is represented in the abandoned quarry at Castlelackan Demesne. Parts are unvegetated bare bedrock or loose rock, while other areas are in various states of revegetation (see **Plate 6.19**). The sparse vegetation includes such species as narrow-leaved plantain *Plantago lanceolata,* daisy *Bellis perennis,* red clover *Trifolium pratense,* glaucous sedge *Carex flacca,* colt's foot *Tussilago farfara,* self-heal *Prunella vulgaris,* fairy flax *Linum catharticum,* oxeye daisy *Leucanthemum vulgare*, bird's-foot trefoil *Lotus corniculatus,* creeping buttercup *Ranunculus acris* and rosebay willowherb *Chamerion angustifolium*. In places, heath species such as bell heather *Erica cinerea*, ling *Calluna vulgaris* and milkwort *Polygala vulgaris* are colonising the gravel surfaces. The mosses *Brachythecium rutabulum, Calliergonella cuspidata, Hylocomium splendens* and *Pseudoscleropodium purum* are represented, as well as the lichen *Peltigera canina.*

Plate 6.19: View of rock surfaces with sparse vegetation within the abandoned quarry at Castlelackan Demesne (February 2024).

6.3.3.12 Buildings and artificial surfaces (BL3)

The various roads and bridges within the study area are classified as Buildings and artificial surfaces. Also in this category are some disused farm buildings which will be demolished for a temporary construction compound. A nearby vacant dwelling will be converted to a proposed operations compound.

Table 6.6: Summary of the main habitat(s) occurring at turbine and other infrastructure component locations.

Location	Main habitat(s) present
AT01	Improved grassland (GA1)/ Wet grassland (GS4)
AT02	Conifer plantation (WD4) / Wet grassland (GS4)
AT03	Conifer plantation (WD4)
AT04	Conifer plantation (WD4)
AT05	Improved grassland (GA1)/Wet grassland (GS4)
AT06	Conifer plantation (WD4)/Wet grassland (GS4)
AT07	Improved grassland (GA1)/Wet grassland (GS4)
AT08	Wet grassland (GS4)
AT09	Conifer plantation (WD4)
AT10	Conifer plantation (WD4)
AT11	Conifer plantation (WD4)/Wet grassland (GS4)
AT12	Conifer plantation (WD4)/Wet grassland (GS4)
AT13	Blanket bog /Wet grassland (GS4)
AT14	Wet grassland (GS4)/Scrub (WS1)
AT15	Conifer plantation (WD4)
AT16	Exposed silicious rock (ER1) / Spoil & bare ground (ED2) / Recolonising bare ground (ED3) / Scrub (WS1)
Substation/Compound TCC	Improved grassland (GA1)
Operations Building, TCC BESS	Improved grassland (GA1)/Wet grassland (GS4)
Met Mast	Conifer plantation (WD4)

6.3.3.13 Invasive species

During the field surveys, a search for Invasive Alien Plant Species (IAS) was carried out.

The main regulations influencing Ireland's invasive species lists are:

- the Third Schedule list of the European Communities (Birds and Natural Habitats) Regulations 2011-2021;
- the Invasive Alien Species of Union concern listed under the EU IAS Regulation [1143/2014].

No species listed on the Third Schedule were recorded during the surveys.

However, Japanese knotweed *Fallopia japonica* has a presence in the general area, with a record from Carrowcor (north of Knockboha Hill) in 2015.

6.3.3.14 Protected flora

In order to determine if any legally protected plant species have been previously recorded from within the development footprint of the proposed development and adjoining areas, a search was made of the online NPWS Flora (Protection) Order 2022 Map Viewer and the Botanical Society of Britain and Ireland (BSBI) online plant distribution Atlas (https://bsbi.org/maps). These searches reveal that there are no records from hectad G13 for species listed in the 2022 Flora Protection Order (Government of Ireland 2022).

The main habitat within the Wind Farm development footprint is wet grassland (GS4), usually dominated by *Juncus effusus*, which does not provide suitable habitat for any rare or protected plant species.

While there are some small areas of blanket bog and cutover blanket bog occurring which could possibly provide habitat for the protected species *Saxifraga hirculus* (marsh saxifrage) and *Hammarbya paludosa* (bog orchid), which have been recorded from a number of sites in north-west Mayo recently, the bog habitat in these areas is not suitably wet or flushed for these species to occur. **Table 6.7** below presents a summary of rare/protected species recently recorded in the north-west Mayo area, with comments regarding the likelihood of presence within the Wind Farm development footprint.

Table 6.7: Rare/protected vascular plant species which have been recorded in north-west Mayo recently (since 2000), with comments on their possible occurrence within the study area.

Species	Occurrence in relation to the survey area	Comments
Saxifraga hirculus (Marsh saxifrage)	Recently recorded from a number of sites in north-west Mayo with the closest known site located 7 kilometres to the west of the survey area.	Species is restricted to flushed areas of bog where there is an influence of base-rich flushing water. The potential for the species to occur within the survey area is very low due to the lack of suitable habitat.
Hammarbya paludosa (Bog orchid)	A very rare species in north-west Mayo. The closest known site for the species is located c. 16 kilometres to the west.	This diminutive orchid species is restricted to very wet and flushed areas of bog with a high cover of Sphagnum. The potential for the species to occur within the survey is very low due to the lack of suitable habitat.
Eriophorum gracile (Slender cotton-grass)	The species is only known from two sites in north-west Mayo, the closest of which is located 13 kilometres south-west of the survey area.	The species is confined to very wet and quaking flushes within intact blanket bog areas. The potential for the species to occur within the survey is very low due to the lack of suitable habitat.

Species	Occurrence in relation to the survey area	Comments
Najas flexilis (Slender Naiad)	The closest known site for this aquatic species is located 22 kilometres to the south-west of the survey area.	Suitable oligotrophic lake habitat does not occur within the survey area, therefore there is no possibility of the species occurring.
Trichomanes speciosum (Killarney fern)	Previously recorded from hectad F93, which is located at least 14 kilometres west of the survey area.	This fern species grows in damp and well shaded rock outcrops which are very rare within the survey area. The potential for the species to occur within the survey area is considered to be low.

6.3.3.15 Grid Connection Route corridor description

The route of the proposed Grid Connection between the Onsite Substation and the existing Tawnaghmore 110 kV Substation is 13.55 km in length. Of this, 12.43 km is located along public roads and 1.12 km is located within the Killala Business Park grounds.

On leaving the Onsite Substation, the route runs eastwards and then south-southwest for just over 2 km along local roads before joining the R314. It continues southeast towards Palmerstown bridge. These roads are lined almost entirely by hedgerows and grass verges with associated ditches (see **Plate 6.20**). The hedging is mostly low, with willow, hawthorn and blackthorn the main tree species. Taller trees are scarce and are mainly ash and sycamore.

After crossing the Cloonaghmore River (by HDD), the route is along local roads as far as the R314 at Carrowreagh (after which it is within the Killala Business Park). These roads are mainly lined with grassy banks and low hedgerows, again dominated by willow as well as hawthorn and blackthorn. In some stretches, the hedges are maintained as low structures (1 - 1.5 m high) (see **Plate 6.21**).

One section of the local road at Castlereagh (extending north for several hundred metres from a tributary of the Cloonaghmore River) is lined by tall trees, mostly ash and sycamore (see **Plate 6.22**). Many of the trees here have a strong ivy cover.

The roadside verges are generally dominated by grassy vegetation with cock's-foot (*Dactylis glomerata*) and Yorkshire fog *(Holcus lanatus*) dominating. Other frequent species in the grassy vegetation include knapweed (*Centaurea nigra*), meadowsweet (*Filipendula ulmaria*), briar *(Rubus fruticosus*), wild angelica *(Angelica sylvestris*), creeping buttercup *(Ranunculus repens*), sweet vernal grass *(Anthoxanthum odoratum*) and common nettle *(Urtica dioica*).

Plate 6.20: Hedging along R314 is generally low, with willow frequent as well as hawthorn and blackthorn. Grassy verges are well represented along both sides of the road. View is from near St. Patrick's College (February 2024).

Plate 6.21: View of local road showing low, maintained hedging and grassy banks. Location is at Magherabrack (February 2024).

Plate 6.22: View of section of local road which is lined with tall trees at Castlereagh (looking northwards). Grassy verges are present along both sides of the road (February 2024).

6.3.3.16 Turbine Delivery Route description

The three options for the TDR, from Killybegs Port, Galway Port, and Foynes Port to the Wind Farm Site will use existing public roads, which are mainly national routes (details in **Turbine Delivery Route Report: Appendix 17.1**). The Second and Final legs of the TDR from Ballina to the Wind Farm Site and turbine locations are mostly along regional and local roads, with the first 4 km (approximately) on leaving Ballina along the N59.

The portions of the routes where there are improvements and temporary accommodation requirements to the public road infrastructure are all between Ballina and the Wind Farm Site. These works will require alterations to the local roads such as temporary widening, hardening of soft verges, hedge trimming and modifying tight bends.

The local roads are typically bounded by grass verges and ditches/banks, with associated hedgerows mostly of a low stature. The hedgerows are similar in composition to those described for the Wind Farm (**Section 6.3.3.8**), with hawthorn, blackthorn and willow the dominant tree species.

6.3.4 Terrestrial Mammals, Amphibians and Reptiles

The Irish hare *Lepus timidus hibernicus* is fairly widespread within the Wind Farm study area and was often observed in the semi-improved pasture fields, with several sightings within the abandoned quarry at Castlelackan Demesne. Some sightings of rabbit *Oryctolagus cuniculus* were also made but the species is considered relatively scarce.
The red fox *Vulpes vulpes* is widespread, with observations (inc. several road casualties) and signs throughout the study site. Deer species have a presence in the area, with sightings and feeding marks especially in the area of the conifer plantations which provide cover for the animals. Any deer seen appeared to be fallow deer *Dama dama,* which reflects the known distribution of deer in Ireland (Lysaght & Marnell 2016).

Various ubiquitous small mammal species, including pygmy shrew *Sorex minutus* (one corpse found along track near wind turbine AT11 in August 2022), hedgehog *Erinaceus europaeus* (fresh road casualty R314, 10th September 2022), field mouse *Apodemus sylvatica* and brown rat *Rattus norvegicus* are expected to be widespread within the Wind Farm study area.

There was no evidence, such as setts, feeding marks or latrines, of badger *Meles meles* activity within at least a 100 m distance of any of the main Wind Farm infrastructure. However, badger has a presence in the area (previous records for the hectad G13, the main 10km square of the study area), though would be scarce in the northern sector as peat habitats provide poor habitat for badger (Smal 1991). Evidence of badger presence in the general study area was shown by the presence of two road kills, as follows:

- Road casualty Carrowmore local road (G 171353), 15th May 2023;
- Road casualty R314, c.100 m north of St. Patrick's College, 6th February 2024.

No signs of otter *Lutra lutra* presence were recorded on any of the watercourses surveyed during the terrestrial ecology field surveys or the aquatic ecology surveys (see **Appendix 6.3**). The Aquatic Ecology assessment showed that many of the watercourses within the study area are small streams with no recorded fish populations (see **Appendix 6.3: Table 4**) and hence would be unlikely to support otter. However, otter has a scattered presence within the hectad G13, including the Killala/Lackan Bay shoreline and the lower stretches of the Cloonalaghan and Cloonaghmore rivers, and is generally well distributed throughout north County Mayo (see Otter Survey of Ireland 2023-2024, Reid et al. 2025).

Pine marten *Martes martes* was not recorded within the study area during the various ecological surveys. As the species has a presence in north County Mayo and has been

recorded in the hectad G13 (at Kilbride), it is probable that it would occur in the conifer plantations within the study area.

The Irish stoat *Mustela erminea*, while not recorded during the various surveys, is widely distributed within County Mayo and can be expected within the hedgerow and woodland habitats in the study area.

The common frog *Rana temporaria* is widespread within the Wind Farm Site study area, including within field drains, wet grassland fields and areas of bog.

Permanent freshwater ponds are largely absent from the immediate Wind Farm study area and there was no evidence of the presence of the smooth newt *Lissotriton vulgaris*. Though not observed, it is possible that smooth newt occurs in the permanent ponds in the disused quarry.

While the common lizard *Zootoco vivipara* was observed in the abandoned quarry in June 2022, the majority of the habitat within the Wind Farm Site study area is not suitable for this reptile.

6.3.5 Bats

6.3.5.1 Desk review results: historical records

The NBDC and Bat Conservation Ireland database was consulted for details on historical bat records held for the site and the surroundings (details in **Appendix 6.2**). The closest historical roosts are located 900 m to the east and 2.3 km to the west, both containing brown long-eared and Natterer's bat roosts.

In addition, multiple records of bats have been recorded during Bat Conservation Ireland's BATLAS 2010. Species recorded included soprano pipistrelle, common pipistrelle, Leisler's bat, brown long-eared bat and Daubenton's bat.

The site does not lie within a lesser horseshoe bat range with the closest records for this species lying 40 km to the SE in Tubbercurry (2008 record) and 40 km south in Bellavary (roost record from 1999).

6.3.5.2 Bat landscape

The bat landscape association model (Lundy *et al.* 2011) suggests that the locations for the proposed turbines are situated in habitats ranging from moderate low to moderate high suitability (see **Appendix 6.2: Table 2.2** for full details).

6.3.5.3 Bat activity surveys

The walked activity surveys recorded a range of bat species typical of the wider landscape, with activity dominated by common and widespread species, especially soprano pipistrelle and common pipistrelle. Additional *Myotis* activity was recorded where calls could not be reliably identified to species level, reflecting the inherent limitations of acoustic identification in cluttered habitats.

6.3.5.4 Bat static detector surveys

The results of the static detector surveys deployed over four survey periods (Spring, Summer and two periods in Autumn) in 2022 and one survey period in Spring 2026 are shown below. Overall, five bat species were recorded from detectors relevant to the site; common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and Natterer's bat, an additional two species were recorded from areas since excluded; Nathusius' pipistrelle and lesser horseshoe bat. Where the call could not be identified to species, the identification was determined to the highest level possible. Several registrations recorded as *Myotis* species were identified only to genus level (though likely to be whiskered bats). The total numbers of recordings for each species from detectors used in risk assessment are presented in **Table 6.8** (and see full details in **Appendix 6.2**).

Highest overall activity was recorded from Detector D set in bog adjacent to conifer plantation located some 1.1 km from the closest turbine (Bp/Hr rate of 10.3). Activity was highest here from the July and August / September 2022 deployments. Soprano Pipistrelle accounted for 88% of these calls.

Much of the detectors placed towards the centre of fields and bogs used in the risk assessment has low activity (detectors E, F, J and L showed activity levels average 1Bp/Hr or less).

Overall, highest activity was recorded from soprano (62%) and Leisler bats (24%), followed by common pipistrelle (7%), with lower numbers from other species.

A single lesser horseshoe bat record was noted from detector no.8 located in the townland of Kilfian West by the Carn stream at 08:24 hrs on 12th October 2022. This record is an anomaly with the closest previous record from 40 km south and is considered a vagrant bat recorded at a period where this species moves from summer to winter roosts. This location lies 1.87 km west of the closest proposed turbine (AT03).

Detailed results on a seasonal basis for all the detectors are provided in **Appendix 6.2.**

Table 6.8: Total recordings for static detectors used in Risk Assessment at Tirawley Wind Farm Site for 2022 and 2026 seasons.

Common Name	No. of recordings for detectors used in risk assessment 2022	All data (used in risk assessments 2022 & 2026)
Brown long-eared bat	180	186
Common pipistrelle	1,116	1,287
Leisler's bat	3,479	3,633
Nathusius' pipistrelle	0	0
Natterer's bat	120	168
Soprano pipistrelle	9,700	9,910
Lesser horseshoe bat	0	0
Myotis sp	767	920
Total registrations	**15,362**	**16,104**

6.3.5.5 Ecobat

Results from the static detector surveys were analysed to interpret bat activity into activity levels (details in **Appendix 6.2**, **Table 4.10**). In-house assessment compares static detector data with similar datasets set in similar habitats and ranks activity levels. ECOBAT was not operational between November 2022 and January 2025, with a new version providing analysis which downplays the percentile of frequently recorded bat species. In-house assessment assigns a more conservative assessment and is based on the original ECOBAT's percentile rates.

In order to prepare the in-house risk assessment for the site, previous ECOBAT data that the author has analysed was used to derive both an activity level and a median percentile. An assessment was conducted only for those species identified as being at high risk of turbine collision; Leisler's bat, common, soprano and Nathusius pipistrelle (following the precautionary approach all 40kHz pipistrelle recordings were added to Nathusius pipistrelle data). In order to ensure quality, all bat calls were manually verified including all noise files.

6.3.5.6 Roost surveys

A max of two soprano pipistrelle bats were observed emerging from a bat roost located to the south of AT01 (Building no. 20 in townland of Carrickana, c.800 m south of AT01). Another roost was located in the townland of Carrowmacshane, c.1.5 km west of AT12 (Building no. 3). A max of five soprano pipistrelle was recorded entering the roost here on 4th July 2022.

The Proposed Development will not require any trees with potential roost features to be felled. While several hedge species and trees will be felled to provide access tracks and temporary clearance works, none were found to contain a potential roost feature. The only turbine found to contain PRF trees within a 252 m buffer is AT14. However, since the initial ground level tree assessment was carried out in 2023 and 2024, two of the trees (20 & 23) have sealed and are now not viable as roost features. Two emergence surveys in April 2026 carried out by the other PRF trees (28, 30 and 32) showed no evidence of bat occupancy.

6.3.6 Aquatic Ecology

6.3.6.1 Description of the aquatic character of the Proposed Development

The Proposed Tirawley Wind Farm and grid connection, Co. Mayo spans three sub catchments; (i) the Glencullin [NorthMayo]_SC_010 sub catchment (Code: 33_9), which is within the Blacksod-Broadhaven catchment, and hydrometric area 33 (Blacksod-Broadhaven); (ii) the Cloonaghmore_SC_010 sub catchment (Code: 34_13), which is within the Moy & Killala Bay catchment, and hydrometric area 34 (Moy & Killala Bay); and (iii) Abbeytown_SC_010 sub catchment (Code: 34_19), which is within the Moy & Killala Bay catchment, and hydrometric area 34 (Moy & Killala Bay) (see **Appendix 6.3**: **Figure 5**). The Proposed Wind Farm Site, which comprises 16 no. turbines, lies within the Glencullin [NorthMayo]_SC_010 sub catchment.

The proposed GCR passes through the Cloonaghmore_SC_010 and Abbeytown_SC_010 sub catchments. The route crosses the 5th order Cloonaghmore river at the Palmerstown Bridge, directly adjacent to the Cloonaghmore Estuary.

6.3.6.2 Water quality

Of the river sub-basins which the Proposed Development spans two are monitored by the EPA and two are not. The Cabintown_010 and Knockboha_010 are not monitored by EPA and are therefore classified as unassigned and their ecological status is unknown. Cloonalaghan_010 and the Gortmore Stream (Mayo)_010 were assessed during the reporting period 2016 – 2021: Cloonalaghan_010 was classified as having 'Good' status with high confidence, and the Gortmore Stream (Mayo)_010 was classified as having 'Good' status with high confidence also.

There are 14 EPA monitoring stations within the Glencullin sub catchment, with five stations located on rivers which have hydrological connectivity with the Proposed Development. Station RS33B060100, called 'Ballymurphy Stream - Bridge just upstream Cloonalaghan Road' is located c. 400 m upstream of the Proposed Development. The water quality was last assessed in 1990 and scored Q 1, indicating 'Bad' water quality. Downstream from this,

Station RS33C010700 is located on the 3rd order Cloonalaghan river (EPA code: 33C01), on the bridge southeast of the Carrowmore. The river was classified as having 'Good' status, with a Q 4 rating when last assessed in 2020. This station is located c. 2.4 km downstream of the Proposed Development. Station RS33C010300 is located at the Bridge southeast of Billoos crossroads and was last assessed in 2005, when the water quality was scored Q4, 'Good' status. This station is located c. 440 m upstream of the crossing point of the river and the Proposed Development. There are two stations on the Gortmore stream, downstream of the Proposed Development: Station RS33G040500, on the bridge east of Ballycastle, was scored Q5, 'High' status when last assessed in 1990 and Station RS33G040800, located on the bridge west of Gortmore, was scored Q4, 'good' status when last assessed in 2020. All values have been obtained from https://gis.epa.ie/EPAMaps/Water. During the WFD Cycle 3 assessment (WFD, 2022) Ballinglen_010 was classified as "At Risk" and was last assessed in 2023, when the water quality was scored 4-5 "High" status, Station RS33B010100. Fish status caused Ballinglen_010 to deteriorate from Good to Moderate ecological status in 2013-2015.

Ballinglen_020 was classified as 'Under Review', and scored Q4, "Good" status when last assessed in 2023. Pressures identified affecting the sub catchment included anthropogenic pressures, urban wastewater, hydro morphology issues, and agriculture.

There are 16 EPA monitoring stations within the Cloonaghmore sub catchment. There are three located at the Palmerstown Bridge, where the 5th order Cloonaghmore river crosses the proposed grid connection route and discharges into the Cloonaghmore Estuary. All three stations, RS34C030280, RS34C030300, RS34C030310 assessed had a water quality Q rating of 4, status "Good" when last assessed in 1989, 1993, and 1989 respectively, with station RS34C030300 directly intersecting with the Grid connection route "GWC03". There is one station further upstream c. 1 km from Palmerstown Bridge on Cloonaghmore_050. This station is RS34C030270, which was last assessed in 2022, achieving a Q4 water quality rating and 'Good' status.

6.3.6.3 Baseline aquatic ecology surveys 2023

The results of the baseline aquatic ecology surveys at the 20 survey locations (see **Plate 6.1**) completed in September 2023 are outlined below. A summary and evaluation of each site is presented in **Table 6.9**. The full survey results, including photographs, are given in **Appendix 6.3.**

Site 1

Site 1 was located on the 2nd order Knockboha River (EPA code: 33K03) in Creevagh, Co. Mayo. This site was located c. 0.6 km from where the Knockboha river discharges into the North Atlantic Ocean / Western Atlantic Seaboard (EU code: IE_WE_250_0000). This site was modified and has been dredged and/or otherwise modified in the past. The substrate was dominated by bedrock. It had high gradient and a series of cascades were present in the survey area. A natural 'falls' on the lower reaches of this river is likely to prevent access for migratory fish. However, otherwise it was considered to have physically suitable salmonid habitat.

The site was visibly polluted and was rated as 'Q3 - Moderately Polluted' due to the amount of filamentous algae and siltation present. A limited macroinvertebrate community dominated by pollution tolerant organisms was present. No fish were recorded during the electrofishing survey which was carried out on two stretches for 10 minutes each. There are no EPA water quality monitoring stations along this river. Overall this site was considered to be of poor habitat and ecological status. The source of the pollution if thought to be agricultural activities.

Site 2

Site 2 was located c. 2.3 km upstream of Site 1, on the 1st order Knockboha River (EPA code: 33K03) in the townland of Knockboha. This is a small stream which was very difficult to access. The stream was partially dry and no fish were present. It was classified as 'At Risk' under Small Streams Risk Score (SSRS) system and was rated as 'Moderate Status'. There are no EPA water quality monitoring stations along this river.

Site 3

This site was located on the 2nd order Conaghra river (EPA code: 33C54) on the border of Killogeary and Keeloges Lower, c. 0.8 km from the confluence with 4th order Cloonalaghan river (EPA code: 33C01). There are no EPA water quality monitoring stations upstream or downstream of this site. This site was silted with agricultural impacts apparent. It has also been modified in the past.

This site was rated as 'Q3-4 – Slightly Polluted' (borderline). There were physically suitable spawning and nursery habitats present, and small numbers of Brown Trout were recorded in the electrofishing survey. Three-spined sticklebacks were also present.

Site 4

This site was located on the 1st order Glebe river, c. 0.3 km upstream of the confluence with the 2nd order Conaghra river (EPA code: 33C54), in the townland of Lecarrowntemple. There are no EPA water quality monitoring stations upstream or downstream of this site. This site is located within the Proposed Development boundary. The stream is very overgrown and partially dry. It was classified as 'At Risk' under the SSRS system. No fish were recorded during the survey.

Site 5

Site 5 was located on the 1st order Conaghra river (EPA code: 33C54), on the border of Lissadrone West and Lecarrowntemple. This site is located c. 2.6 km upstream of the confluence with the 4th order Cloonalaghan river (EPA code: 33C01). There are no EPA water quality monitoring stations upstream or downstream of this site. This site is located within the Proposed Development boundary.

The stream here was classified as 'At Risk' under the SSRS system and no fish were recorded. Tiny overgrown stream, very little invert life, and is too small to provide any habitat for fish.

Site 6

This site was located on the 1st order Conaghra river (EPA code: 33C54), c 1.2 km upstream of Site 5. Site 6 is located in the townland of Conaghra. There are no EPA water quality monitoring stations upstream or downstream of this site. This site is located within the Proposed Development boundary. It is a tiny stream with limited macroinvertebrate fauna and fisheries potential. It was classified as 'At Risk' under the SSRS system. No fish were recorded.

Site 7

Site 7 was located on the 1st order river Keeloges Upper (EPA code: 33K05). The site was located approximately 1 km upstream of the confluence with the 4th order Cloonalaghan river (EPA code: 33C01). The site was located in the Killogeary townland. There are no EPA water quality monitoring stations upstream or downstream of this site. This stream is very small, was partially dry, had limited macroinvertebrate fauna, and was not considered to provide a habitat for fish. It was rated as 'At Risk' under the SSRS system. No fish were recorded.

Site 8

Site 8 was located on the 2nd order river Lissadrone East (EPA code: 33L01), on the border of the townlands of Carrowmore and Lissadrone East. There are no EPA water quality monitoring stations upstream or downstream of this site. This site is located c. 133 m from the Proposed Development. This stream is very small, had limited macroinvertebrate fauna, and was not considered to provide a significant habitat for fish.

Three-spined sticklebacks were recorded during the survey. The site was rated as being 'Moderate Status'.

Site 9

This site was located on the 3rd order Cloonalaghan river (EPA code: 33C01), on the border of the townlands of Carrowmore and Cloonalaghan townlands. There is an EPA monitoring station (Site reference RS33C010700) here. The river was classified as having 'Good' status, with a Q4 rating when last assessed in 2020. This was the same rating assigned in the current survey. Class A Heptageniid mayfly larvae were present. This river site has been modified in the past but is physically suitable for salmonid and lamprey habitats. Good numbers of Brown trout were recorded during the electrofishing survey. Good numbers of European eels were also recorded. No juvenile salmon or lampreys were recorded. Overall, this site was considered to be meeting 'Good status criteria.

Site 10

Site 10 was located on the 1st order Ballymurphy stream (EPA code: 33B06). There is an EPA water quality monitoring station (Station code: RS33B060100) called 'Ballymurphy Stream - Bridge just upstream Cloonalaghan Road' located c. 0.5 km upstream from Site 10. The EPA rated this station as Q1 in 1990, indicating 'Bad' water quality, but has not been monitored since. This site is located within the Proposed Development boundary. The site was classified as 'At Risk' using the SSRS system during the current survey. No fish were present. The site was assessed as 'Moderate Status'.

Site 11

Site 11 was located in Carrad More on the 3rd order Cloonalaghan river (EPA code: 33C01), c. 15 m upstream of the confluence with the 1st order Knockroe river. There is an EPA water quality monitoring station (Station code: RS33C010700) located approximately 1.2 km downstream, at the Bridge southeast of Carrowmore. This station was rated as 'Q4 – Unpolluted' when last assessed by the EPA in 2020. This indicates 'Good' water quality.
This is a small stream that has been deepened and channelised in the past. It is considered to offer marginal fish habitat and a limited macroinvertebrate community was recorded. It

was rated as 'Q3 – Moderately Polluted' in the current survey due to the absence of Class A indicators, and the dominance of pollution tolerant taxa. There was evidence of agricultural impacts at the site. Brown trout and Three-spined sticklebacks were present. No lampreys were recorded.

Site 12

Site 12 was located on the 3rd order Cloonalaghan river (EPA code: 33C01), on the border of the townlands of Carn and Barroe. The site was located c. 0.9 km upstream of the confluence with 2nd order Cloonavarry river. This site is located within the Proposed Development boundary.

There is an EPA water quality monitoring station (Station code: RS33C010300) located c. 1.1 km upstream at the Bridge southeast of Billoos crossroads. The EPA rated this station as 'Q4 - Good' status' in 2005. This site has not been monitored since this time.

This is a small stream and agricultural impacts were apparent during the survey. A limited macroinvertebrate fauna was recorded, with Class C and D groups dominating. Silt and algae levels were considered to be elevated. The site was considered to be 'Q3 – Moderately Polluted'. Small number of Brown trout were present however. No other fish species recorded.

Site 13

Site 13 was located on the 1st order Carn river (EPA code: 33C44). The site was located in the townland of Billoos, at the confluence of the 2nd order Billoos river (EPA code: 33B36) An EPA water quality monitoring station (Station code: RS33C010300) is located c. 0.8 km downstream at the Bridge southeast of Billoos crossroads. This station was rated as 'Q4 - Good' status' in 2005. This is a small stream but has some habitat suitable for salmonids, and nominal numbers of juvenile Brown trout were recorded during the survey confirming that this is a salmonid nursery stream.

Site 14

Site 14 was located on the 2nd order Cloonalaghan river (EPA code: 33C01), on the border of Ballybeg and Billoos. This site is located c. 1.2 km upstream of the confluence with the 2nd order Billoos river and c. 1.7 km upstream of the EPA water quality monitoring station (Station code: RS33C010300) mentioned above. During the current survey, forestry and agricultural impacts were noted, and the site was classified as 'At Risk' under the SSRS system. No fish were recorded.

Site 15

Site 15 was located on the 1st order Cloonavarry river (EPA code: 33C43), c. 0.8 km upstream of its confluence with the 2nd order Moneen river (EPA code: 33M22) at St Patrick's College, Lackan Cross. This site is heavily impacted by agricultural pollution (rated Q2-3). No fish were recorded during the current survey.

Site 16

Site 16 is located on the 3rd order Gortmore Stream, c. 0.9 km downstream of the confluence of the 2nd order Lecarrowntemple river (EPA code: 33L13) and 3rd order Gortmore stream. The EPA monitoring station RS33G040500 is located c. 2.1 km downstream at the Bridge east of Ballycastle. This station was last assessed in 1990 when it was rated 'Q5 – High Status'.

This watercourse was considered to provide ideal salmonid spawning and nursery habitat. Potential lamprey habitats were also recorded. This was a clean watercourse with a diverse macroinvertebrate community present. It was rated a 'Q4 – Unpolluted' in the current survey. Good stocks of brown trout were recorded. No lampreys were recorded. This catchment has some potential for Freshwater Pearl Mussels. However, they were not recorded at this site and some spot checks downstream of the site were also completed. The EPA site at Ballycastle was also visited. Although this site was not surveyed it was visibly not a 'Q5' channel with algae and siltation apparent. There are no records of Freshwater Pearl Mussels from this river.

Site 17

Site 17 was located on the 2nd order Lecarrowntemple river (EPA code: 33L13), c. 0.75 km upstream of the confluence with the 3rd order Gortmore Stream. The nearest EPA monitoring station is c. 3 km downstream (Station: RS33G040500), at the Bridge east of Ballycastle. This site is located c. 150 m north of the Proposed Development boundary.

This site is a small stream but has physically suitable salmonid spawning and nursery habitat. A relatively diverse macroinvertebrate community was present, and normal siltation and sparce filamentous algae levels were present. The site was therefore rated as 'Q4 Good status' in the current survey. Small numbers of juvenile Brown trout were present confirming that this is a salmonid spawning and nursery channel.

This catchment has some potential for Freshwater Pearl Mussels. However, they were not recorded at this site and some spot checks downstream of the site were also completed (at Site 16).

Site 18

Site 18 was located on the 2nd order Lecarrowntemple river (EPA code: 33L13), c. 2.3 km upstream of the confluence with 3rd order Gortmore Stream. This site is located c. 550 m west of the Proposed Development boundary, on the border of the townlands of Lissadrone West and Lecarrowntemple. This is a tiny overgrown stream. No fish were recorded at this site and the site was classified as 'At Risk' following the SSRS system.

Site 19

Site 19 was located on the 2nd order Gortmore Stream (EPA code: 33G4). This site is located c. 380 m from the Proposed Development boundary in Aghaleague. The site was located c. 1.2 km upstream of the confluence with the 2nd order Lecarrowntemple river. This is a small stream with some potential salmonid spawning and nursery habitat present. It was considered to meet the criteria for a 'Q4 - Good Status' rating. Brown trout were recorded here.

Site 20

This final site was located on the 2nd order Cabintown river (EPA code: 33C52) on the border of Carrowmore and Kilbride. This site was located approximately 1.2 km downstream of the Proposed Development boundary. It was also located c. 0.47 km upstream of the confluence with the 2nd order Carrowmore river (EPA code: 33C57). There is no EPA monitoring station on this channel. This is a tiny overgrown stream. No fish were recorded, and the site was rated 'Moderate status', or classified as 'At Risk' under the SSRS system.

Table 6.9: Summary and evaluation of the aquatic ecology survey of 20 sites during September 2023

Site No.	Water-course name	Biological Water quality	Aquatic habitat	Fish population	Rare / notable species	Overall evaluation
1	Knockboha River	Poor (Q3) visible eutrophication	Modified but physically suitable for salmonids. Natural falls likely to prevent access for migratory fish.	No fish recorded – two 10-minute sites fished.	None	Poor Status
2	Knockboha River	SSRS – "At risk"	Partially dry, tiny overgrown stream	No fish present	None	Moderate Status
3	Conaghra river	Q3-4	Has suitable spawning and nursery	Small numbers of salmonids present. Three	None	Moderate Status

Site No.	Water-course name	Biological Water quality	Aquatic habitat	Fish population	Rare / notable species	Overall evaluation
			habitats. Agricultural impacts and modifications .	spined sticklebacks present. No lampreys present.		
4	Glebe river	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status
5	Conaghra river	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status
6	Conaghra river	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status
7	Keeloges Upper	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status
8	Lissadrone East	SSRS – "At risk"	Tiny stream	Three-spined sticklebacks	None	Moderate Status
9	Cloonalagha n river	Q4	Modified in the past but has physically suitable salmonid and lamprey habitats.	Brown trout present in good numbers, good numbers of eels, no lampreys.	None	Good status
10	Ballymurphy stream	SSRS – "At risk"	Small stream with agricultural impacts	No fish present	None	Moderate Status
11	Cloonalagha n river	Q3	Small stream with agricultural impacts	Brown trout (nominal numbers) and Three-spined sticklebacks present. No lampreys.	None	Moderate Status
12	Cloonalagha n river	Q3	Small stream with agricultural impacts	Brown trout (nominal numbers).	None	Moderate Status
13	Confluence of the Billoos river and Carn river	Q4	Small stream with some physically suitable salmonid habitat.	Brown trout (nominal numbers). No lampreys.	None	Good Status
14	Cloonalagha n river	SSRS – "At risk"	Tiny stream with forestry and agricultural impacts	None	None	Moderate Status
15	Cloonavarry river	Polluted – Q2-3	Small stream with agricultural pollution	None	None	Poor Status

Site No.	Water-course name	Biological Water quality	Aquatic habitat	Fish population	Rare / notable species	Overall evaluation
16	Gortmore stream	Q4+	Ideal salmonid spawning and nursery habitat	Good healthy trout stock present. No lampreys present.	None present at this site. This catchment has some potential for FPMs in the it's lower reaches.	Good status +
17	Lecarrowntemple river	Q4	Small stream but potential salmonid spawning and nursery habitat	Brown trout present (nominal numbers). No lampreys present.	None present at this site. This catchment has some potential for FPMs in the it's lower reaches.	Good status +
18	Lecarrowntemple river	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status
19	Gortmore Stream	Q4	Small stream but potential salmonid spawning and nursery habitat	Brown trout present (nominal numbers). No lampreys present.	None	Good status
20	Cabintown river	SSRS – "At risk"	Tiny overgrown stream	No fish present	None	Moderate Status

6.3.7 Marsh Fritillary

While *Succissa pratensis* (foodplant of marsh fritillary) was often a component of the vegetation in wet grassland and in marginal areas of bog, the distribution was localized and nowhere abundant. As the criteria for habitat in good condition for marsh fritillary, *i.e.* three or more well-developed devil's-bit scabious plants per square metre across more than twenty percent of the habitat, were not present within the survey area, further survey for this species was not merited.

6.3.8 Summary of Ecological Receptors and Conservation Value of Project Area

6.3.8.1 Habitats, vegetation and flora

The Wind Farm Site is dominated by improved agricultural grassland, wet grassland and conifer plantation. Improved grassland is a habitat of low botanical interest - rated as Local Importance (lower value). Wet grassland can vary in ecological interest depending on

wetness and management practices but in general is rated as Local Importance (lower value). Conifer plantation is an alien habitat that is not rated as of conservation importance. The hedgerows within the Wind Farm Site, the area of broadleaved woodland (off the R314), and the willow scrub within the abandoned quarry at Castlelackan Demesne are all typical for north County Mayo and rated as Local Importance (higher value).

While the blanket bog at the proposed location for wind turbine AT13 is considered active, i.e. dominated by peat-forming species, the area of bog is rated not more than Local Importance (higher value) as it is a relatively small area (7.65 ha) of shallow bog (maximum 1.1 m depth at turbine location), which shows signs of past disturbance, especially in the southwest (2 small former fields adjoining local road) and the northwest. To the north, there is conifer plantation and to the west wet grassland fields. A local playing field adjoins the bog to the south-east. While further bog of similar quality occurs to the northeast, an old track separates the two areas. The areas of blanket bog which adjoin the disused quarry to the east and northwest are also rated as of Local Importance (higher value).

The abandoned quarry at Castlelackan Demesne supports a mosaic of habitats associated with past disturbance, including bare or sparsely vegetated rock and gravel surfaces, ponds and scrub, and the complex is rated as of Local Importance (higher value).

The terrestrial habitats along GCR and TDRs largely comprise roads edged with grassy verges and mostly low hedgerows - all rated Local Importance.

No nationally rare or legally protected plant species listed in the 2022 Flora (Protection) Order were recorded from within the Wind Farm Site during the surveys nor are there any past records of such species from the study area.

6.3.8.2 Terrestrial mammals, amphibians and reptiles

The Wind Farm Site supports a typical mammalian fauna of agricultural pastoral land and coniferous plantation.

The Irish hare and all deer species are protected under the Wildlife Acts, as is the pygmy shrew and hedgehog.

While the watercourses within the Wind Farm Site are of low value for otter, the larger stretches of rivers downstream of the site and the coastal fringe support this species. Otter is listed on Annex II of the EU Habitats Directive as amended.

All mammal species recorded within the Wind Farm Site, or expected to occur, are listed as 'Least Concern' on the Irish Red List (Marnell *et al*. 2019).

The common frog and the common lizard are protected under the Wildlife Acts, though both are listed as 'Least Concern' on the Irish Red List (King *et al*. 2011).

6.3.8.3 Bats

The bat landscape association model suggests that the locations for the proposed turbines are situated in habitats ranging from moderate low to moderate high suitability for bats. During bat activity surveys, a total of four species were recorded: soprano pipistrelle, common pipistrelle, brown long-eared and Leisler's bat.

During static surveys, a total of five species of bats were recorded: soprano pipistrelle, common pipistrelle, Leisler's bat, brown long-eared bat and Natterer's bat. Several registrations recorded as *Myotis* species were identified only to genus level. The most commonly recorded species were soprano pipistrelle, followed by Leisler's bat and common pipistrelle, with lower levels from other species.

All bats recorded are classified as 'Least Concern' on the Irish Red List (2019) and protected under the EU Habitats Directive as amended Annex IV and Wildlife Acts as amended.

6.3.8.4 Aquatic ecology

The importance of the watercourses within the area of the Wind Farm Site have been assessed in the Aquatic Ecology Assessment (**Appendix 6.3)**. The Wind Farm Site is drained by three river subbasins: Cloonalaghan_010, Gortmore Stream (Mayo)_010, and Knockboha_010. The watercourses on the proposed Wind Farm Site itself are all small – medium 3rd, 2nd, and 1st order streams. These streams are in the upper reaches of the Gortmore Stream (Mayo)_010 and Cloonalaghan_010 sub catchments. These watercourses are of limited aquatic ecological value. However, downstream at the receptor sites where the rivers increase in size fish diversity and habitat quality improves. Many of these watercourses have been identified as being salmonid nursery and spawning areas.

6.4 ASSESSMENT OF POTENTIAL EFFECTS

6.4.1 The 'Do-Nothing' Effect

Without the proposed Wind Farm proceeding, it is expected that the present main land-uses within the area of the Wind Farm Site, namely agriculture and forestry, will continue. As the conifer plantations mature, they will be harvested and replanted. Further forestry may also be

planted. The small area of blanket bog at the wind turbine AT13 location is likely to remain as it is, though it is possible that the bog could be planted with commercial forestry or subject to future turbary. The future use of the abandoned quarry at Lackan Hill will be at the discretion of the owners. However, in the absence of any future development, scrub is likely to spread, as well as grassland vegetation on gravel surfaces and spoil heaps.

Overall, in the absence of the Proposed Development, the ecology of the Wind Farm Site would be expected to remain fairly similar as at present.

6.4.2 Potential Effects on European Conservation Sites

The AA Screening report that accompanies this planning application has shown objectively that for four of the European sites identified (as in **Table 6.3** above) there are no realistic Source-Pathway-Receptor linkages and hence there is no potential for effects on the Qualifying Interests or Special Conservation Interests as a result of the Proposed Development. These sites are:

- River Moy SAC (code 002298)
- Bellacorick Bog Complex SAC (code 001972)
- Glenamoy Bog Complex SAC (code 00500)
- Lough Conn and Lough Cullin SPA (code 004228)

It is considered that these four European sites can be excluded from further assessment. However, in the absence of mitigation, likely or possible significant effects on three of the European sites listed in **Table 6.3** could not be excluded during the construction, operational and/or decommissioning stages of the Proposed Development:

- Lackan Saltmarsh and Kilcummin Head SAC (code 00516)
- Killala Bay/Moy Estuary SAC (code 000364)
- Killala Bay/Moy Estuary SPA (code 002041)

As it is considered that, in the absence of mitigation, the risk of likely or possible significant effects on these European sites cannot be ruled out and that there is potential for effects on their Qualifying Interests or Special Conservation Interests as a result of the Proposed Development, they are subject to further consideration and a Natura Impact Statement (NIS) has been prepared. Full details on the potential for adverse effects on these three European sites are given in the accompanying NIS.

6.4.3 Potential Effects on National Conservation Sites

6.4.3.1 Natural Heritage Areas

As noted, there are three Natural Heritage Areas (NHAs) within the zone of influence of the Tirawley Wind Farm (see **Figure 6.2** and **Table 6.4**). These sites are designated for peatlands and are situated between 8 km and 11 km to the west and southwest of the Wind Farm Site.

As there is no ecological or hydrological connectivity between the Proposed Development Site and the NHAs, there is no potential for effects as a result of the Proposed Development. It is concluded that further consideration of these three NHAs is not required.

6.4.3.2 Proposed Natural Heritage Areas

There is a total of ten proposed Natural Heritage Areas (pNHAs) within the zone of influence of the Proposed Development (see **Figure 6.2** and **Table 6.4**).

Five of the pNHAs are also designated as SACs or SPAs, namely Lackan Saltmarsh and Kilcummin Head, Killala Bay/Moy Estuary, Lough Conn and Lough Cullin, Bellacorick Bog Complex and Glenamoy Bog Complex. Potential impacts on these five sites are referred to in **Section 6.4.2** above and are discussed in detail in the accompanying AA Screening Report and NIS.

Of the remaining five pNHA sites, there is no ecological or hydrological connectivity between the Wind Farm Site:

- Downpatrick Head pNHA
- Creevagh Head pNHA
- Killala Esker pNHA
- Cloonagh Lough pNHA
- Benedereen Head pNHA

As there is no potential for effects on these five sites as a result of the Proposed Development, further consideration of these sites is not required.

6.4.4 Effects on Habitats, Vegetation and Flora

The construction of the Proposed Development will result in the following effects on terrestrial habitats and flora:

- Permanent loss of habitat
- Temporary loss of habitat

- Disturbance to habitats
- Changes to existing habitats

In addition, some tree pruning works will be required along parts of the TDR(s) to facilitate large transport vehicles.

6.4.4.1 Permanent loss of habitat

The permanent loss of habitat at the Wind Farm Site, *i.e.* habitat which will be replaced by wind farm infrastructure including Turbine Foundations and hardstand areas, Onsite Substation, BESS and new Site Access Tracks and road upgrades, is estimated at 9.21 ha. The majority of the permanent habitat loss is improved/semi-improved grassland, wet grassland and conifer plantation. These habitats are widespread throughout county Mayo and the island of Ireland. It is noted that conifer plantation is a non-native habitat and can have adverse effects on local areas of bog due to the spread of self-seeded trees. The effect by the loss of these habitats is rated as Not Significant.

The construction of wind turbine AT13 will result in the permanent loss of approximately 0.68 ha of blanket bog, the total plot having been rated as Local Importance (higher value). While this plot of bog, which has a total area of 7.65 ha, will also be fragmented by the turbine and associated Site Access Track, it is noted that the remaining area of bog between the turbine and the public road to the south had been used as two small fields in the past and is now a mix of blanket bog and wet heath on shallow bog. Due to the importance of any area of peatland habitat (as noted in Section 10.4.5 of the Mayo County Development Plan 2022-2028), the loss and disturbance of blanket bog at this location is rated as an Adverse Significant Effect of Permanent Duration at a Local level of importance. The loss of blanket bog will be offset through a Biodiversity Enhancement and Management Plan (BEMP) (see **Section 6.8** and **Appendix 6.4**).

While the route for internal cabling will cross through a stand of broadleaved woodland alongside the R314, rated as Local Importance (higher value), the crossing will be by HDD and there will be no disturbance to the woodland.

The Proposed Development will result in the permanent loss of an estimated 1,155 m of hedgerow for facilitation of access points from public roads (800 m) and the various infrastructure (approximately 355 m). The hedgerows affected are typical of the area (see **Section 6.3.3.8**), being mostly on low banks and associated with field ditches. Some of the hedges to be taken out are sections with existing field entrances (such has been used where feasible to minimise loss).

In addition, an estimated total of (449 m) of hedging and woodland edge (latter mostly conifer plantation), will be removed for the purpose of providing bat buffers around turbines (where relevant) (see **Section 6.5.6.1**).

The total permanent removal of hedgerows will be **1,604 m.**

Hedgerows are important habitats in the local area, rated Local Importance (higher value), and support a range of flora and fauna species including breeding and feeding birds, foraging bats and small mammal species. The Mayo County Development Plan 2022-2028 recognises the importance of hedgerows in Natural Environment Objective 4: "*To protect and enhance biodiversity and ecological connectivity in County Mayo, including woodlands, trees, hedgerows….*". The significance of the loss of hedgerows due to the Proposed Development is rated as an Adverse Significant Effect of Permanent Duration at a Local level of importance. The loss of hedgerows will be offset through a replanting scheme within the study area (see **Section 6.5.2.1**).

6.4.4.2 Temporary loss of habitat

To facilitate the delivery of the turbine components sections of hedgerows along the route will be removed as part of road widening (see **Appendix 17.1: Turbine Delivery Route Report** for details). The hedging will later be replaced along the new road edges. It is estimated removal is required at 14 no. locations at the Wind Farm Site and that approximately 2,009 m of hedging will be removed. A further 495 m of hedging will be removed for improvements and temporary accommodation requirements along the TDR between Ballina and the Wind Farm Site, giving a total of 2,504 m.

As already noted, hedgerows are important habitats in the local area for various fauna and flora species and provide ecological corridors. While these hedges will be replaced with new plantings, it is considered that the new plantings will take up to ten years or more to develop structure and diversity comparable to the hedging being removed. The significance of the loss of hedgerows along the TDR is rated as an Adverse Significant Effect of Medium-term Duration at a Local level of importance. In the long-term (>15 years), this effect is likely to become Neutral.

The two proposed TCCs will be constructed in areas of improved to semi-improved agricultural grassland. When complete, the compound areas will be levelled and reseeded as grassland. As improved grassland is not of significant ecological value, the effect of this impact is Not Significant.

6.4.4.3 Disturbance to habitats

Areas of habitats adjoining the infrastructure at the Wind Farm Site will be disturbed by the construction works, including the construction of an onsite drainage system. This will result in areas and strips of bare soil, which would be prone to erosion. For most areas, the disturbance will be to grassland (improved and wet) and cleared conifer plantation, habitats which are of low ecological value. For such habitats, this effect is rated as Not Significant. Mitigation is required, however, to minimise the areas of bare soil so as to limit the potential for soil erosion leading to effects on local watercourses.

At the wind turbine AT13 location, disturbance will be caused to blanket bog adjoining the work site. This will result in both direct physical disturbance of bog and effects on the bog hydrology. The significance of disturbance to adjoining blanket bog is rated as a Moderate Adverse effect of Medium-term duration. Mitigation to minimise disturbance of blanket bog, and to minimise the potential for peat erosion of bare surfaces, as a result of construction works will be implemented (see **Section 6.5.2.2**).

The laying of the Grid Connection cable will cause localised disturbance to marginal vegetation alongside the roads due to trenching works and use of plant machinery. The amount of disturbance would vary depending on the exact line of the trench, but is likely to affect grassy verges and roadside banks or ditches. However, hedging or trees will not be removed to facilitate the works. Generally, there are no habitats of significant ecological interest alongside the roads of the GCR. After the trenching works are complete, full recovery of the marginal vegetation is likely to take place within 1-2 years. The effect of disturbance to roadside habitats is rated as Not Significant.

6.4.4.4 Changes to existing habitats

A total of 31.86 ha of conifer plantation will be removed as a result of the Proposed Development. Part of this area will be built upon with infrastructure and the remainder left fallow. The fallow area will be alongside the infrastructure, such as along new Site Access Tracks through forestry or will be required as bat buffers around the turbine bases.

The areas left fallow along the roads, roughly to a distance of 10 m, are expected to develop as a mosaic of rank grassland and scrub (willows, brambles etc). This more open habitat will be of some benefit to small mammals, birds and insects, and overall will be of more value to local biodiversity than the existing conifer plantation. The effect of this change in habitat is rated as a Positive effect of moderate significance.

Mitigation for bats requires that trees, hedging and scrub are removed from a minimum of 85 m around turbine locations (where required) and that the ground is maintained as a mowed sward or near bare (gravel) for the lifetime of the Proposed Development. Such habitat will be of minimum value to local wildlife. The effect by this change from conifer plantation is rated as Neutral, *i.e.* one habitat of low value replaced by another of low value.

6.4.4.5 Works along Turbine Delivery Route

A total of 14 locations have been identified between Ballina and the final turbine locations where some works will be required to facilitate the passing of the abnormal loads (see details of works required at the locations in **Turbine Delivery Route Report: Appendix 17.1**). Some of these works will be relatively minor in nature, for example temporary removal of street furniture and signage, while some sections will require alterations to the local roads such as temporary widening, hardening of soft verges, and modifying tight bends on local roads.

As already described, hedging will be removed at some locations to facilitate road widening (see **Section 6.4.4.2** above). This will be temporary removal, with replanting along the new road edge.

In addition, the trimming of hedgerows and the pruning back of branches of overhanging trees will be required along most of the identified locations along the route. The effect of trimming of hedgerows and the pruning back of branches is generally Not Significant, though seasonal mitigation will apply.

6.4.5 Potential Effects on terrestrial mammals, amphibians and reptiles

The effect on terrestrial mammal species by the loss and disturbance of grassland habitats at the Wind Farm Site is considered to be Not Significant on the basis that the species involved, including Irish hare and foraging badgers, are all widespread species of the countryside which will still occur within the study area (where grassland is the dominant habitat) as well as in the wider environs.

The effect on terrestrial mammal species by the loss and disturbance of conifer plantation due to the Proposed Development is Not Significant as conifer plantation is a frequent habitat in north County Mayo and localised mammal species such as pine marten would still be expected to utilise the stands of forest plantation which will remain in the immediate area (subject to ongoing commercial forest operations).

The permanent and temporary loss of hedgerows will affect a range of small mammal species, including Irish stoat, long-tailed field mouse and hedgehog. While the clay banks of hedgerows provide optimum habitat for badgers to construct setts, there was no evidence of setts in the sections of hedgerow surveyed at the impact locations. The effect on mammal species by the loss of hedgerows is rated as a Moderate Adverse effect of Medium-term duration.

The various proposed watercourse crossing points will not affect any breeding site of otter. However, the local otter populations downstream of the sections of watercourses affected by the Proposed Development could be affected adversely if contaminants generated during the construction phase, such as suspended solids, hydrocarbons and cementitious materials, were to enter the local watercourses and affect the prey items (fish etc.) of the otter. In the absence of mitigation, the effect on the otter population could be Significant. Mitigation to maintain water quality during the construction and operational phases of the Proposed Development will minimise the risk to the otter population.

Construction activity would be expected to cause larger mammals such as deer to remain in cover whilst the works are on-going. However, this will be a localised and temporary effect (and not generally relevant to nocturnal mammal activity) and the effect is considered to be Not significant.

The common frog is widespread throughout the study area and the Proposed Development and it can be anticipated that construction works will have effects on drainage ditches which are utilised by the species. Similarly, suitable breeding ponds for the common frog, as well as possibly for the common newt though aquatic vegetation is sparse, will be affected by the deposition of spoil in the disused quarry. Mitigation will be implemented for amphibian species to minimise destruction of spawn, tadpoles and adult frogs during construction (see **Section 6.5.4).** As viable breeding populations of these species are expected to remain in the study area, the significance of the effect on amphibian species within the Wind Farm Site is rated as a Slight Adverse effect.

The common lizard population is likely to be confined to the disused quarry (AT16 location) and possibly the area of blanket bog at wind turbine AT13. It is unlikely that the works will have significant effects on the common lizard population.

6.4.6 Effects on bats

Common, Nathusius's and soprano pipistrelle alongside Leisler's bats are high risk species for wind farm collisions (see **Table 6.10** below from NIEA 2021). NIEA (2021) states that

peaks of bat activity should be accounted for in addition to median levels to appropriately quantify risk. The report also noted the Leisler's bats, while fairly rare in Britain, are one of the commonest species found in Ireland. However, given their rarity in the rest of the UK, and indeed Europe, the Irish population is considered a global stronghold for the species and therefore we have an international responsibility for its protection.

Table 6.10: Level of potential vulnerability of populations of British bats.

Table 2: *Level of potential vulnerability of populations of British bat species. (Adapted from Wray et al., 2010)*

Yellow = low population vulnerability

Beige = medium population vulnerability

Red = high population vulnerability

Relative abundance	England	Collision risk		
		Low collision risk	Medium collision risk	High collision risk
	Common species	Brown long eared bat		Common pipistrelle Soprano pipistrelle
	Rarer species	Daubenton's bat Natterer's bat Whiskered bat Brandt's bat Lesser horseshoe	Serotine bat	Nathusius' pipistrelle Noctule bat Leisler's bat
	Rarest species	Alcathoe bat Bechstein's bat Greater horseshoe Grey long eared bat	Barbastelle bat	

6.4.6.1 *Initial site risk assessment*

Following NIEA Guidance (2021), while also acknowledging the recently published BCI 2026 guidelines, an initial risk assessment has been completed for the present project based on an assessment of habitats and the size of the development. Habitat suitability is ranked either low, moderate or high, while project size is ranked from small, medium and large. Habitats surrounding the subject turbines are ranked as Moderate given connectivity to the wider landscape with the presence of hedgerows, treelines and sections of conifer plantation. While there are streams running through the site, the nearest river lies over 2.3 km (from AT02). In addition, roost searches (desktop and emergence surveys) did not reveal the presence of maternity roosts for at risk species in close proximity to the site. Two satellite roosts for soprano pipistrelle bats were noted, one 800 m south of AT01 had two bats, while a maximum of five bats was observed entering a building located 1.5 km to the west of AT12.

Project size is where in-combination effects of the site alongside other windfarms are considered in the SNH 2021 guidance document. For Tirawley, there are no other

commercial windfarms within 5 km. Two domestic turbines, attached to the side of houses, are within a 5 km buffer; 1.1 km to the northwest of AT15 and 4.1 km southeast. Notwithstanding this, the project is still categorised as large, as while the proposed development contains a moderate number of turbines (16), and with no other operational windfarms within a 5 km radius, turbines reach over 100 m in height.

The proposed Tirawley windfarm thus derives an Initial Site Risk Assessment Value of 4 = high site risk.

6.4.6.2 Overall risk assessment

At present, there is no accepted methodology for predicting bat collision rates at proposed wind energy developments. Risk assessment is therefore based on relative activity levels, species ecology, turbine characteristics and published evidence of vulnerability, with mitigation designed on a precautionary basis.

The output from the initial site risk assessment is used in the below matrix (**Table 6.11**) to derive an overall risk assessment based on the activity level of high collision risk species. The new BCI 2026 guidelines risk assessment matrix has also been acknowledged in the overall risk assessment matrix. This considers Leisler's activity over the 40th percentile as being of high risk. Ireland is considered the world stronghold for Leisler's bat, with an estimated population of 73,000 – 130,000 (2007-2012) (Roche, 2014).

Due to the levels of nightly bat activity at each of the static locations, 9 turbines are considered of high risk to either soprano pipistrelle or Leisler's bats based on median results. Based on SNH 2021, turbines AT02, AT03 and AT04 are considered high risk for soprano pipistrelle. Turbines AT05, AT06, AT09, AT10, AT12 and AT15 have now also been considered high risk for Leisler's bat based on the new BCI 2026 guidelines.

6.4.6.3 Effects on potential bat roosts

A max of two soprano pipistrelle bats were observed emerging from a bat roost located to the south of AT01 (Building no. 20 in townland of Carrickana, c.800 m south of AT01).

Another roost was located in the townland of Carrowmacshane, c.1.5 km west of AT12 (Building no. 3). A max of five Soprano Pipistrelle was recorded entering the roost here on 4th July 2022.

The Proposed Development will not have an effect on these roosts.

The Proposed Development will not require any trees with potential roost features to be felled.

Table 6.11: Summary of overall risk assessment for each turbine based on survey data for Tirawley project.

Turbin	Static	Leisler's bat		Common pipistrelle		Soprano pipistrelle		Is location	High impact based on BCI 2026	If no mitigation is
		Maximum Percentile	Median Percentile	Maximum Percentile	Median Percentile	Maximum Percentile	Median Percentile			
AT01	G	20	12	20	8	20	12	No	No	Medium
	C	16	8	16	4	20	8			
	Combined	18	10	18	6	20	10			
AT02	H	16	12	12	4	20	16	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT03	H	16	12	12	4	20	16	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT04	H	16	12	12	4	20	16	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT05	F	20	12	16	4	16	8	Relatively close	Yes based on Leisler's percentile rate being 41 or over.	High
AT06	F	20	12	16	4	16	8	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT07	K	20	8	16	4	16	8	No	No	Medium
AT08	K	20	8	16	4	16	8	Close	No	Medium
AT09	B	20	12	16	4	20	12	No	Yes based on Leisler's percentile rate being 41 or over.	High

Turbine	Static	Leisler's bat		Common pipistrelle		Soprano pipistrelle		Is location	High impact based on BCI 2026	If no mitigation is
		Maximum Percentile	Median Percentile	Maximum Percentile	Median Percentile	Maximum Percentile	Median Percentile			
AT10	B	20	12	16	4	20	12	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT11	A	20	8	16	4	20	8	Close	No	Medium
AT12	A	20	8	16	4	20	8	No	Yes based on Leisler's percentile rate being 41 or over.	High
	B	20	12	16	4	20	12			
	Combined	20	10	16	4	20	10			
AT13	A	20	8	16	4	20	8	No	No	Medium
	E	20	8	16	4	16	4			
	Combined	20	8	16	4	18	6			
AT14	A	20	8	16	4	20	8	No	No	Medium
	L	16	8	16	8	16	8			
	Combined	18	8	16	6	18	8			
AT15	B	20	12	16	4	20	12	No	Yes based on Leisler's percentile rate being 41 or over.	High
AT16	L	16	8	16	8	16	8	No	No	Medium

6.4.7 Effects on Aquatic Ecology

As noted in **Section 6.3.6.3**, the watercourses on the proposed Tirawley Wind Farm site itself are all small – medium 3rd, 2nd, and 1st order streams, and are of limited aquatic ecological value. However, downstream at the receptor sites where the rivers increase in size fish diversity and habitat quality improves. Many of these watercourses have been identified as being salmonid nursery and spawning areas.

The GCR passes a number of 4th and 5th order rivers, primarily in the Cloonaghmore_060 sub catchment.

6.4.7.1 Construction phase

Direct Effects

There is potential for releases of suspended solids and other substances associated with upgrading, realigning, and construction of access roads within the Wind Farm Site and also during the excavation work associated with this proposed work. The installation and upgrading and/or extension of an internal road network on a wind farm site and associated excavations can result in increased silt runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning sites of salmonids.

A total of n=12 watercourse crossings are proposed. The proposed crossing points are listed in Table 8 of **Appendix 6.3**. No other works will occur within a distance of at least 50 m from watercourses (excluding watercourse crossings). No works will occur within a distance to land drains of at least 20 m.

Engineering works in the vicinity of streams and at stream crossings can also impact directly on physical habitat, for example nursery areas for fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers. Obstruction to upstream movement of fish, particularly salmonids, due to construction of culverts can also potentially occur.

'Improved' drainage of the Wind Farm Site can potentially result in increased erosion of nearby streams and may result in lower water levels in dry weather, which will reduce the habitat available to fish. Any operations which result in loss of sediment will also result in increased nutrients being released from the soil. This has the potential to cause eutrophication of streams thereby lowering the capacity of the streams to support fish and invertebrate fauna.

The construction of the proposed Wind Farm is not expected to significantly affect the drainage regime on the site, with direct effects on watercourses and aquatic ecology minimised via the protection of water quality within the site. The site surveys also revealed that the watercourses draining this area are currently impacted by background water quality issues, such as agricultural practise. Potential direct construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being *slight negative, short-term and in the local context*. Best practice mitigation is required to avoid potential effects.

Indirect Effects

The most likely potential indirect effect during the construction phase of the wind energy development on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality. This type of effect would include an accidental release of silt laden runoff, or an accidental spillage of cement or hydrocarbons stored onsite. Waste from on-site toilets and wash facilities could also potentially be released. These effects could potentially occur on any construction site and will be avoided with best practice mitigation.
Indirect water quality effects can potentially occur during the construction of Site Access Tracks, the laying of cable route as well as any works required to facilitate the indicative turbine delivery route. These works could result in silt run-off, pollution events originating from the site works and machinery used, which could indirectly affect areas elsewhere in the catchment. These indirect effects could give rise to the potential for impacts affecting fish, as well as aquatic invertebrate communities within the study area.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river is also a major concern and can have serious negative effects on aquatic invertebrate and instream flora.

There is also a risk that machinery or materials imported onto the Wind Farm Site could act as a vector for introducing or dispersing non-native invasive species.

Potential indirect construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being *Slight negative, short-term and in the local context*. Mitigation is required to avoid potential effects.

6.4.7.2 Operational phase

Operational wind farms are not normally considered to have the potential to significantly impact on the aquatic environment (O'Connor, 2017). The main risk to watercourses is when oils and lubricants are used on the site. If such substances leaked from the turbines or maintenance areas or were disposed of inappropriately, there is a risk of water pollution. However, the likelihood of this occurring is very low and the potential significance of this effect can be mitigated through proper site management. In addition, the watercourses on the Proposed Development Site are of relatively low ecological value. Spills of any oil or fuels from site vehicles onto the access roads may find their way to the local stream network. However, this is unlikely to be a significant impact considering the low numbers of vehicles involved and the high-quality standards that are implemented on a well-managed site.

Upgrading of the site track/road network could allow increased public access to the Wind Farm Site. This could potentially result in illegal dumping of domestic rubbish which could impact the watercourses in the area by causing deterioration in water quality. Potential operational phase effects on aquatic ecology are assessed as being *Imperceptible negative, temporary and in the local context.*

6.4.8 Decommissioning Phase Effects

A Decommissioning Plan accompanies the EIAR (see **CEMP Management Plan 6: Decommissioning Plan**). There follows an overview of the decommissioning process.

The Developer is applying for a consent for an operational period of 35 years for the Wind Farm. It is intended that all above ground components and underground cabling (ducting left in-situ) will be removed from the Wind Farm Site as part of the decommissioning of the Tirawley Wind Farm. The following elements are included in the decommissioning phase:

- Removal of 16 no. wind turbines and concrete plinths
- Removal of 1 no. permanent meteorological mast
- Removal of all associated underground electrical and communications cabling connecting the wind turbines to the Wind Farm Onsite Substation. Ducting is to remain in-situ
- Reinstatement of the operations building and associated structures to its original residential use
- Removal of Battery Energy Storage System (BESS), namely the containers and their concrete plinth foundations, and the compound in which they are housed.

All other elements of the Proposed Development will remain in-situ. The Site Access Tracks and associated drainage systems will serve ongoing forestry and agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the

experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful.

Prior to wind turbine removal, due consideration will be given to any potential effects arising from these operations. Potential effects are likely to be similar to that of the construction phase, to an equal or lesser extent. Some of the potential issues could include:

- Potential disturbance by the presence of cranes, HGVs, and personnel on-site
- Time of year and timescale (to be outside sensitive periods).

Prior to the decommissioning work, a comprehensive plan will be drawn up and submitted to An Coimisiún Pleanála (or equivalent planning agency at the time) for written agreement. The plan will take account of the findings of the EIAR for the present project and the contemporary best practice at that time, to manage and control the component removal and ground reinstatement.

The key targets of the Decommissioning Plan are as follows:

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation.
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community. This will relate to transport, particularly of material off site with noise and dust also impacting on receptors at time of decommissioning to a lesser extent.
- Ensure decommissioning works and activities have minimal impact on the natural environment. Disturbance to habitats will be avoided and the use of existing infrastructure and drainage will ensure silt does not enter waterways.
- Adopt a sustainable approach to decommissioning. This means comparing alternative methods for turbine disassembly and taking the approach with the least impact on the natural environment; and,
- Provide toolbox talks, environmental training and awareness of sensitive receptors and waste management within the Wind Farm Site for all project personnel.

From the perspective of ecology, the anticipated potential impacts would be:

- Disturbance to blanket bog at the AT13 turbine location,
- Disturbance to breeding birds and protected mammal species which may be onsite at the time,

- Potential pollution of local waterways and ultimately various designated sites,
- Creation of new habitats onsite.

6.4.8.1 Decommissioning phase: Disturbance of bog

The blanket bog at the wind turbine AT13 location is of significant ecological importance and any disturbance to the bog during the works to dismantle the turbines would be an adverse impact of potential significance. The Decommissioning Plan has a target of minimal effect on the natural environment and it is not anticipated that personnel will need to traverse out onto the high bog surface for any reason. The Plan also highlights a target of providing training on sensitive receptors on the Wind Farm Site to all involved personnel.

With work carried out in accordance with the Plan, it is not likely that the Decommissioning works will have adverse effects on the bog habitat onsite.

6.4.8.2 Decommissioning phase: Disturbance of fauna species

Particular care will be taken to ensure that the decommissioning works do not cause disturbance to animal species occurring on the Wind Farm Site at the time. Pre-construction baseline surveys will be carried out for species identified of conservation importance during the 2022-24 baseline surveys, as well as for further species of importance which may be present at the time of the works. Relevant legislation relating to flora and fauna in force at the time will be strictly adhered to.

Mitigation measures described in the present report to avoid or minimise disturbance to protected fauna species will be implemented as necessary.

With the above approach followed, it is not likely that the decommissioning works will cause significant disturbance effects to fauna species associated with the Wind Farm Site.

6.4.8.3 Decommissioning phase: Maintenance of water quality

The issue of potential impacts on hydrology is reviewed in **Chapter 9: Hydrology and Hydrogeology (Section 9.4.7)**. The assessment notes the following:

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures. No significant effects on the hydrological and hydrogeological environment are envisaged during the decommissioning phase of the Development.

On this basis, it is likely that the decommissioning works will not result in adverse effects on local watercourses.

6.4.8.4 Decommissioning phase: Creation of new habitat

The Decommissioning Plan specifies that the Turbine Hardstands will be allowed to naturally revegetate. At the time of decommissioning, parts of the hardcore surface will likely already support a sparse flora of annual and perennial species (this is normal to see at operational wind farms after a few years and indeed often attracts sheep to graze the tender shoots). The amount of vegetation that will eventually colonise will depend on the chemical character of the gravel surface, *e.g.* a calcareous substrate would support a higher diversity of plants than an acidic substrate. Such recolonising surfaces, which retain warmth in sunshine compared to surrounding areas of bog, tend to attract insects (butterflies *etc.*) as well as passerine bird species such as skylark and various finches, with the birds feeding on seeds from plants. The habitat that would be expected to develop is likely to fall into a mosaic of semi-natural grassland (GS) and artificial stone surfaces (BL3).

The natural re-vegetation of the above-mentioned surfaces is rated as a Positive effect of Moderate significance.

6.5 MITIGATION MEASURES

6.5.1 Designated sites

The present report has identified likely pathways between the area of the Proposed Development and three European sites, namely:

- Lackan Saltmarsh and Kilcummin Head SAC (code 00516)
- Killala Bay/Moy Estuary SAC (code 000364)
- Killala Bay/Moy Estuary SPA (code 002041)

In the absence of mitigation, there is a risk that contaminants generated by the Proposed Development during the construction, operation and decommissioning phases could enter local watercourses and ultimately flow to the designated sites where there could be resultant adverse effects on water quality and aquatic life and relevant qualifying interests within the sites. Mitigation is therefore required to minimise this risk.

The mitigation proposed to maintain water quality in the drainage channels and watercourses which drain the area of the Proposed Development are detailed in the **Aquatic Ecology Assessment** (**Appendix 6.3**) and in **Chapter 9: Hydrology and Hydrogeology**. The mitigation measures which are required to ensure that there are no adverse effects on the Conservation Objectives of the three European Sites are also contained within the accompanying NIS. The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative

measures have been incorporated into the project design in order to minimise potential significant adverse effects on water quality at the Wind Farm Site.

Within the Wind Farm Site all turbine locations and associated infrastructure have a buffer zone of at least 50 m from natural streams, with a 20 m buffer to significant drains. No works shall take place within these buffer zones except for the watercourse crossings on the access track network. Implementation of such buffer zones will result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads shall not be permitted under any circumstances. This in turn shall avoid or reduce the potential for adverse effects on downstream designated sites.

All of the mitigation measures described in **Appendix 6.3** and in **Chapter 9** are contained in the Construction and Environmental Management Plan (CEMP) (appended to the EIAR in **Appendix 2.1**). The CEMP provides a contractual commitment to mitigation and monitoring, and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Proposed Development shall be managed through the CEMP and shall be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and shall be continued through to the commissioning, operation and final decommissioning phases.
It is noted that an Ecological Clerk of Works (ECoW) with experience in overseeing wind farm construction projects shall be appointed by the Contractor for the duration of the construction phase to ensure that the CEMP is effectively implemented and that all planning conditions relating to biodiversity are complied with. An Environmental Manager shall be appointed by the Developer to oversee the environmental management of the project, advise on the environmental issues and ensure compliance by the Contractor.

With such mitigation in place and rigorously enforced, it can be concluded that there would not be any significant effects on the qualifying interests of the identified designated sites as a result of the Proposed Development.

6.5.2 Mitigation for Habitats

6.5.2.1 Habitat loss

The Proposed Development will result in the loss of a limited amount of habitat of significant ecological importance, namely an area of blanket bog at wind turbine AT13 location (0.68 ha) and various hedgerows throughout the project area.

As the loss of blanket bog cannot be mitigated, this loss shall be offset through a Biodiversity Enhancement and Management Plan (BEMP). The BEMP is outlined in **Section 6.8** and is presented in full in **Appendix 6.4**. Briefly, the BEMP area comprises the abandoned quarry at Castlelackan Demesne (other than the part of quarry required to facilitate turbine AT16). The quarry had been built in an area of blanket bog and the property still supports approximately 3.9 ha of relatively intact bog. This bog shall be preserved, and where feasible enhanced, for the lifetime of the Proposed Development.

The BEMP shall also provide mitigation for the overall effects on biodiversity as a result of the Proposed Development, with preservation and enhancement of areas of willow scrub, grassland, rock surfaces (bare to sparsely vegetated) and ponds.

The permanent loss of hedgerows and trees shall be offset through a planting scheme. The planting will follow best practice, including guidance from the Department of Agriculture, Food and the Marine ACRES scheme.

As noted in **Section 6.4.4.1**, the estimated permanent losses are as follows:

New entrances from public roads	800 m
Internal breaches of hedgerows by infrastructure	355 m
Losses for bat buffer mitigation at turbines (inc. forest edge)	449 m
Total estimated linear loss	**1,604 m**

Taking into account the value of local hedgerows and that the new plantings will take up to 10 years to equal in structure and diversity the hedges removed, a greater area will be replanted than is removed. A figure of 50% above the loss is considered appropriate, which results in a length of **2,406 m** to be replanted.

A strip of 3 m width will be allowed for staggered planting (see below) and fencing as required. The area required for the replacement planting of permanent hedging is therefore **7,218 m^2** or **0.72 ha**.

As noted in **Section 6.4.4.2**, the TDR will require the removal of **2,504 m** of hedging from along roads to facilitate road widening. While this will be replanted along the extended road edge when works are complete, the temporary loss is significant as there will be an interval of up to ten years before the replanted hedging attains similar value to what will be removed. Due to the ecological value of hedgerows, additional mitigation is required for this temporary loss and it is considered appropriate that 50% of this figure, *i.e.* **1,252 m**, is replanted

elsewhere as permanent hedging to offset this temporary adverse effect. Using a 3 m planting strip width, this amounts to **3,756 m^2** or **0.376 ha.**

From above, the amount of new planting required to offset the permanent and temporary loss of hedgerows is **3,658 m** or **10,974 m^2 (1.097 ha).**

Additional losses of scrub, mostly willow and gorse, will be lost to create bat buffers at wind turbines AT09 and AT13, which is estimated at **0.29 ha**.

In summary, the total area of hedging, trees and scrub required to be planted to offset the losses is as follows:

	Length (m)	Area (ha)
Permanent hedgerow loss	2,406 m	0.72 ha
Temporary hedgerow loss	1,252 m	0.376 ha
Scrub at bat buffers	-	0.29 ha
Total	**3,658 m**	**1.39 ha**

To reflect the losses across the Wind Farm Site, the total area to be replanted will be distributed at three locations (see **Plates 6.23-6.25**), as follows:

AT01 / substation:	1.11 ha available
AT06 location:	0.67 ha available
AT14 location:	1.01 ha available
Total land available for planting	2.79 ha

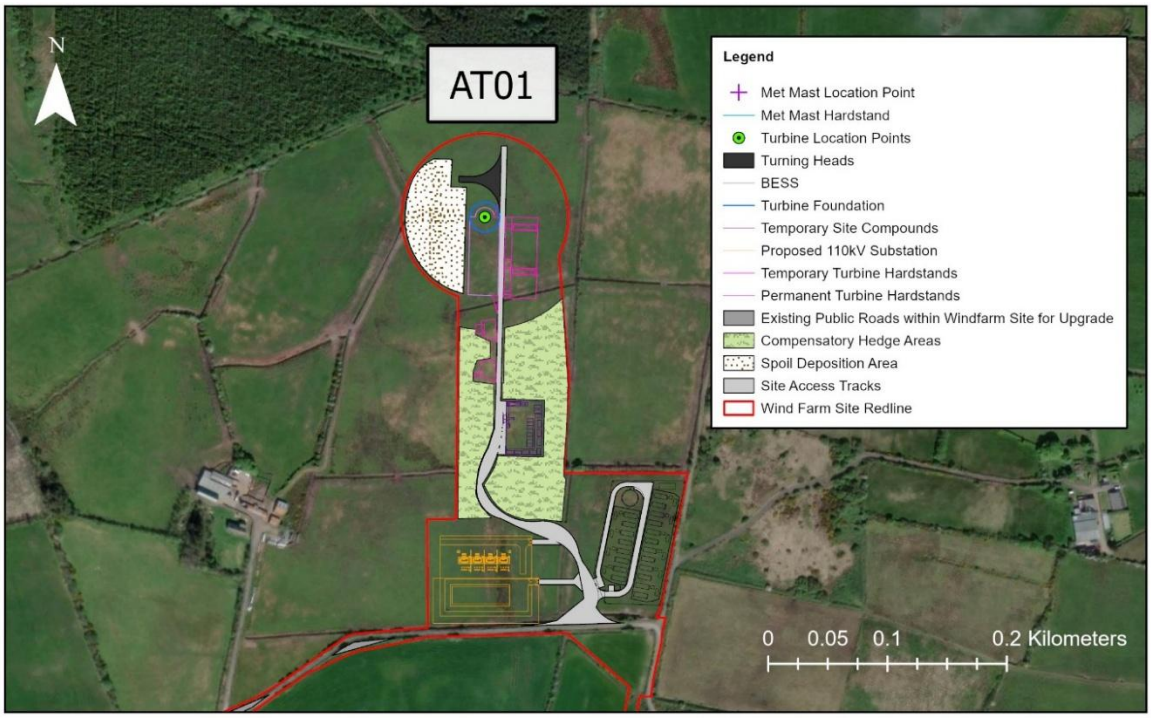

Plate 6.23: Detail of native woodland planting at AT01 location.

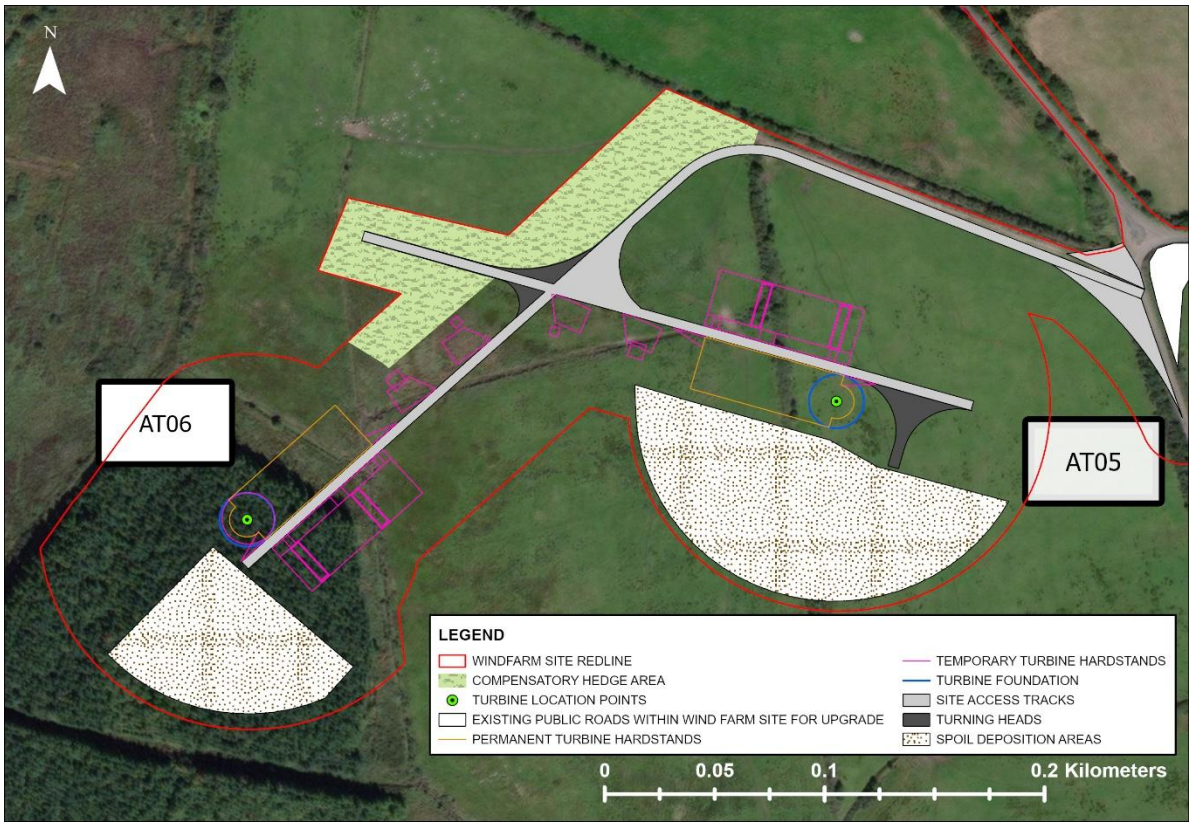

Plate 6.24: Detail of native woodland planting at AT06 location.

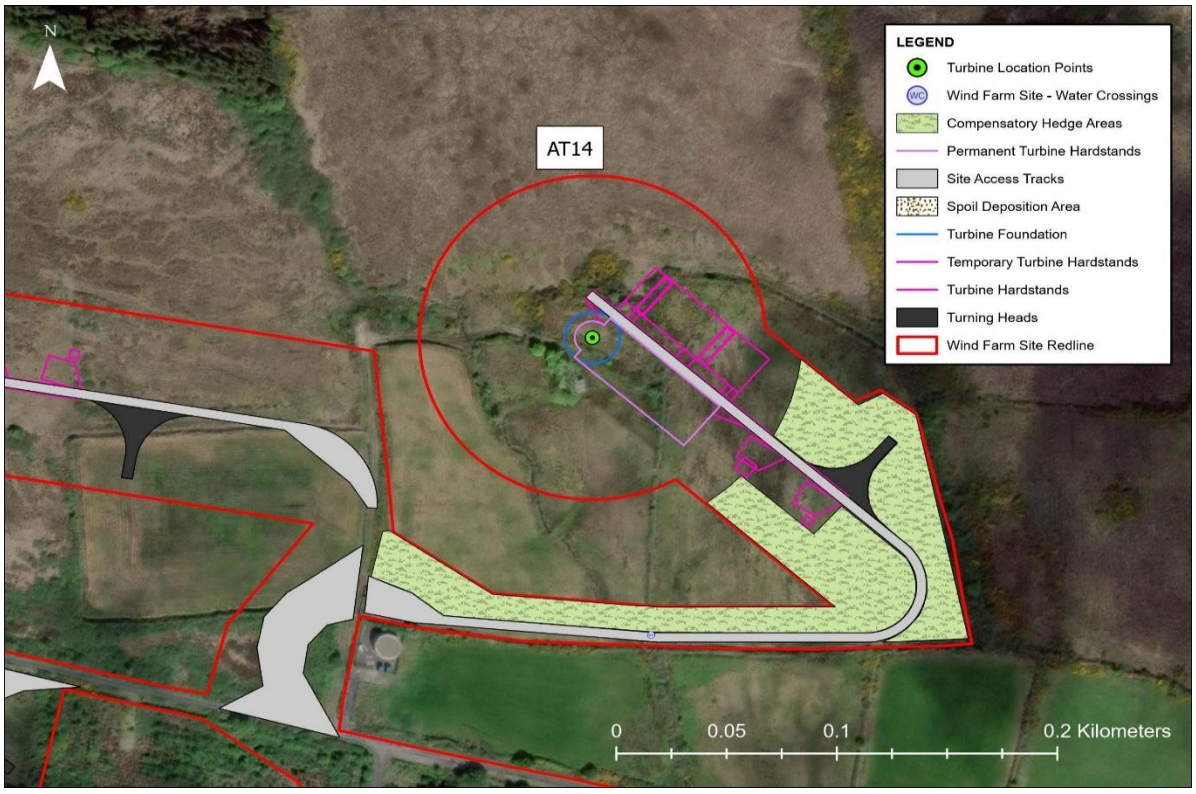

Plate 6.25: Detail of native woodland planting at AT14 location.

An ecologist shall advise on the exact design and details for the new plantings. To maximise the biodiversity potential, the plantings shall connect with ecological features such as existing hedgerows and treelines. The plantings shall comprise both linear strips and broader stands of woodland.

The following guidance shall be adhered to for hedge planting:

- As soon as a date is agreed for the commencement of construction, the first step in the schedule shall be the planting of the new hedgerows/woodland strips within the appropriate season. The earlier planting is carried out the better, as this will allow time for these features to establish prior to the loss of existing features.
- Plantings shall consist of native Irish species from Irish genetic stock (certified Irish). Hedgerow species which have a fairly widespread presence in the area, and which are useful biodiversity species, include hawthorn, blackthorn, grey willow (*Salix cinerea* subsp. *oleifolia*), hazel, holly, rowan (*Sorbus aucuparia*), alder (*Alnus glutinosa*), guelder rose (*Virburnum opulus*) and spindle (*Euonymous europaeus*). Formerly ash would be used as a principal tree standard but is not being planted due to ash dieback disease. Instead, sessile oak (*Quercus petraea*) is a suitable species.
- Hedgerows shall be planted in a double staggered row within strips of 3 m width. Spacing will be 20-30 cm apart using 60-90 cm high 'whips'. The dominant species shall be hawthorn, blackthorn, grey willow and hazel (20-50% each), with holly, rowan, alder, spindle and guelder rose as supporting species (less than 10% each). Alder and willow would be particularly useful if along watercourses.
- Tall trees shall be planted at approximately 30 m intervals and shall consist mainly of sessile oak, though species such as alder can be allowed to grow tall.
- The planted strip shall be fenced off from livestock (where required). Trees planted as standards shall be individually fenced to protect from deer.
- Fertiliser application shall not be permitted.
- The control of competing vegetation is critical for the establishment and growth of young trees. Inadequate vegetation management will result in mortality, loss of growth and vigour and the need for further inputs during the establishment process.
- Any plants that fail shall be replaced on an annual basis for the first five years since start of planting programme.

6.5.2.2 Mitigation to minimise disturbance of bog and promote re-vegetation

As described in **Section 6.4.4.3,** the construction works will cause disturbance to adjoining bog habitat around the AT13 turbine site, as an area will be needed by the Contractor to facilitate the works. To minimise disturbance to the bog and to ensure good recovery, as

well as to minimise areas of bare peat which would be prone to erosion, the following programme will be adhered to during the construction phase.

Restricted access to bog

At the commencement of works, the required work footprint on the bog shall be identified and the area shall be marked by a rope fence (using wooden poles) and with appropriate signage. No construction activities shall be allowed outside of the agreed work area for the duration of the construction period. The ECoW shall inspect the site regularly whilst works are on-going. Excavated peat and subsoil shall be removed to the approved deposition area, with no storage of peat or any other materials on the adjoining bog area. The rope fences shall remain in place until the works at this location are fully complete.

Re-vegetation of bare surfaces at work area

An ecological objective is to minimise the area of exposed peat surface and to encourage rapid re-vegetation of the disturbed bog surface at wind turbine AT13 location. This shall be achieved by the removal of the vegetated bog surface within the work footprint, the storage of this material, and subsequent re-use around the turbine and hardstand margins.

First, a suitable local area shall be identified where the removed material can be stored for the duration of the works – it is noted that such areas will not be on other vegetated bog surfaces but rather grassland habitat. Also, it is important that the selected storage areas shall not be prone to disturbance for the duration of the required storage period.

The approach to 'save' the surface vegetated material shall be as follows: the surface shall be cut-out as sods or 'turves' to a depth of approximately 20-30 cm using a dumper/digger with a bucket. Care will be taken to keep the turves as intact as possible and the vegetated side upwards. The turves shall be loaded to a trailer and transported to the pre-identified storage area. The turves shall be off-loaded from the trailer and placed side by side and vegetation side upwards. They shall be placed in single layers, *i.e*. not piled on top of each other. Should storage of the above materials be for prolonged periods (months), the stored turves and peat piles will need to be watered during dry spells.

When ready for placement at the finished turbine/hardstand, the turves shall be lifted with a dumper and bucket and taken to the destination. Here they shall be off-loaded and placed side by side on the disturbed bog surface with vegetation side up. The turves shall be bedded in with the bucket of a dumper so that they form a continuous layer without gaps between them. This approach will provide almost immediate cover of the bare surfaces.

All of the above processes will be monitored by the ECoW.

6.5.3 Otter

While there was no evidence of otter presence at any of the stream crossing points, downstream of the site the main rivers and the coastal strip provide suitable habitat to support otter populations. Such populations could be affected adversely by pollutants entering the watercourses as a result of activities associated with the Proposed Development.

The mitigation proposed to maintain water quality in the aquatic zones (as detailed in the **Aquatic Ecology Assessment Appendix 6.3** and in **Chapter 9: Hydrology and Hydrogeology**, and summarised in the CEMP) will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the Proposed Development.

6.5.4 Badger

Whilst no signs of badger presence were found within a 100 m distance of the work areas during the baseline surveys, badger does occur in the wider area and distribution of local populations can change over time. As more than 36 months will have elapsed since the baseline surveys in 2022-23, a pre-construction confirmatory survey will be undertaken in accordance with NRA Guidance (2006). This will focus on the areas of the site where works will take place (to a distance of approximately 100 m).

Should an active sett be located within a 50 m distance of the works area, mitigation would be necessary to ensure that the sett is closed prior to the commencement of any works onsite. This procedure would be carried out in strict accordance with relevant legislation.

6.5.5 Common frog and smooth newt

The common frog is widespread within the Wind Farm Site occurring in drains, fields which are permanently wet, bog and in the ponds within the abandoned quarry at Castlelackan Demesne. Areas where construction works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint. The ponds within the abandoned quarry at Castlelackan Demesne have some potential to support the smooth newt though aquatic vegetation is notably sparse. Prior to the commencement of construction works within the quarry, a survey for the smooth newt will

take place within the ponds. Should newts be recorded in ponds that could be affected by the works, these shall be removed to one of the other ponds onsite, under licence.

6.5.6 Bats

6.5.6.1 Construction phase mitigation for bats

6.5.6.1.1 Buffer zone

Bats typically use woodland edge habitats for commuting and feeding purposes. Areas of conifer plantation should be felled in order to discourage bat species from flying close to turbines. Various publications provide guidelines on buffer zones surrounding turbines to reduce the favourability of the site for bat activity. Eurobats 'Guidelines for consideration of bats in wind farm projects' (Rodrigues, et al., 2015) recommend buffer zones of 200 m from turbine base to high potential features whilst Natural England Bats (England, 2014) recommend 50 m buffers from blade tip to tree. NIEA (2021) recommends a minimum buffer of 100 m between the turbines at the edge of commercial forestry where wind farms are proposed to be key-holed.

For Tirawley turbine hub height will be 76.5 m, while blade length is 58.7 m. A separate calculation has been completed for turbines surrounded by hedgerows (feature height 13 m) and treelines (24 m). The following formula is used to calculate the distance required from the turbine base.

$$\mathbf{B} = \sqrt{(50 + Bl)^2 - (HH - FH)^2}^{2}$$

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

Thus, turbines will have either a 88 m or 94 m buffer (see **Appendix 6.2, Table 7-1**)

Buffer 88 m = Turbines AT01, AT05, AT07, AT08, AT13

Buffer 94 m = Turbines AT02, AT03, AT04, AT06, AT09, AT10, AT11, AT12, AT14, AT15, AT16.

While the creation of buffers has been used as a mitigation measure extensively, Berthinussen (2021) shows that no detailed study has been conducted showing its effectiveness. Barré (2018) highlights habitat loss (potentially due to creation of buffers) impacts can be considerable in windfarm development and proposes no net loss of high biodiversity value landscape features. As an alternative to the loss of the trees and scrub adjacent to AT14 and AT16 it is proposed to strengthen curtailment at these locations (see below).

6.5.6.1.2 Retention of Trees and Replacement Planting

Trees and treelines along approach roads and Site Access Tracks will be retained unless felling is unavoidable. Retained trees will be protected from root damage by an exclusion

zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

A replanting programme will mitigate for the loss of hedgerows, treelines and mature trees which serve as commuting corridors and possibly roosts for bats (see details in **Section 6.5.2.1**).

6.5.6.1.3 Measures Specific for Turbine AT08

Turbine AT08 has a thick southern hedge bordering a stream to the south within the 88 m buffer. Instead of felling these areas, curtailment will be implemented, offering an alternative protection to bat species.

6.5.6.1.4 Measures Specific for Turbine AT14

Turbine AT14 has a number of trees and scrubby woodland of good quality within the 94 m buffer. Instead of felling these areas, curtailment will be implemented, offering an alternative protection to bat species.

6.5.6.1.5 Measures Specific for Turbine AT16

Turbine AT16 is located within an abandoned quarry that contains scrub around its border and within the quarry itself. Instead of felling a buffer around the turbine, additional curtailment measures will be implemented to offset potential effects on bats and monitoring will be conducted post construction to maintain this quarry as a wildlife diversity area.

6.5.6.1.6 Lighting Restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Construction operations within the Wind Farm Site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works along the GCR and Wind Farm Site may occur at night but the Environmental Manager/ECoW shall limit night-time works to sections of the route / site which avoid sensitive features (*e.g.*, mature treelines). Where lighting is required, directional lighting, *i.e.* lighting which only shines on work areas and not nearby countryside, will be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

6.5.6.2 Operation Phase Mitigation for Bats

6.5.6.2.1 Lighting Restrictions

Fixed lighting is required at the BESS, Substation and Permanent Operations building. Outdoor lights here will consist of LED luminaires using warm white colours less than 2400 Kelvins. Luminaires will feature peak wavelengths higher than 550 nm to avoid the component of light most disturbing to bats.

Lighting will be directional and avoid lighting key features suitable for bat activity such as treelines or woodland edge. Sensory lights shall be used, thus only turned on when required.

6.5.6.2.2 Feathering of Blades

All turbines shall enact a feathering protocol when wind speeds are below the cut-in speed of the turbine. Feathering entails pitching turbine blades at 90 degrees or parallel to the wind to reduce their rotation speed while idling to below two revolutions per minute. This measure does not reduce economic output as electricity is not generated below the cut-in speed of wind turbines and is shown to reduce bat mortality (NIEA, 2021), SNH, Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019, Wellig, 2018, Rydell, 2010).

6.5.6.2.3 Cut-in Speeds/Curtailment

Curtailment refers to the practice of increasing the cut-in speed of wind turbines and feathering the blades to reduce their operation during periods of high bat activity. The typical manufacturer's set cut-in speed is between 3.0 and 4.0 m/s (SNH, Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019).

Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. (Arnett (2011) showed increasing the cut-in speed reduces bat fatalities.

Turbines AT02, AT03, AT04, AT05, AT06, AT09, AT10, AT12 and AT15 require curtailment due to either soprano pipistrelle or Leisler's activity.

Turbines AT08, AT14 and AT16 require curtailment as an alternative to clearing good landscape features.

Cut-in speeds restrictions will be operated according to specific weather conditions.

1 When the air temperature is above 10°C at nacelle height.
2 Wind speeds below 5.5 m/s (at nacelle height).

Alternative smart curtailment option

Due to the considerable unnecessary down time resulting from the proposed "blanket curtailment" (above) and the advances in smart curtailment, a focused curtailment regime is further proposed from the Year Two of operation.

This will focus on times and dates, corresponding with periods when the highest levels of bat activity occur within the site. This includes the use of the SCADA (Supervisory Control and Data Acquisitions) operating system (or equivalent) to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

Post-constructions surveys will be undertaken for the first three years of operation to confirm if blanket curtailment restrictions can be amended in line with post-construction activity levels (see **Section 6.10.2**). The post construction surveys will be used to update the current curtailment regime (blanket curtailment) designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all of the following:

- Wind speed in m/s (measured at nacelle height)
- Time after sunset
- Month of the year
- Temperature (ºC)
- Precipitation (mm/hr)

6.5.6.2.4 Buffer Zones

The vegetation-free buffer zones (refer to **Section 6.5.6.1.1** above) around the identified turbines will be managed and maintained during the operational life of the Proposed Development.

Due to mitigation by design, turbines are proposed to be sited at a separation distance from trees where effects on treelines, hedgerows and woodland is minimised.

The immediate surroundings of individual turbines will be managed and maintained so that the areas have minimal potential to attract insects. This will be achieved through physical management of habitats without the use of toxic substances.

Scrub will not be cleared surrounding AT14 and AT16 as the scrub here is of significant biodiversity value. As stated above, curtailment will be implemented at these locations to facilitate this.

With the above mitigation implemented in full, the risk of bat fatalities on site will be minimised.

6.5.7 Aquatic Ecology

6.5.7.1 Construction phase mitigation

A Construction Environmental Management Plan has been prepared for the proposed project. All aquatic-related mitigation measures are incorporated into the CEMP. Compliance with the CEMP, the procedures, work practises and controls will be mandatory and must be adhered to by all personnel and contractors employed on the construction of the Proposed Development.

A Surface Water Management Plan has been included in the CEMP (**Management Plan no. 3**). This has had regard to the NatureScot (2019), CIRIA (2016), NRA (2008b) and IFI (2016) guidelines. This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters. The Surface Water Management Plan sets out measures to avoid siltation, erosion, surface water run-off and accidental pollution events, which all have the potential to adversely affect water quality within the Site during the construction phase. It also includes preparatory works on the Site, including installation of silt fences and bunds.

All access tracks shall be designed to minimise excavation on the site and reduce the risk of sediment runoff. A sealed silt fence shall be placed at both sides of points where rivers or streams are crossed and to a minimum of 10 m upstream and downstream of each crossing at both sides of the road. Swales for turbine bases and hard standings shall be constructed.

All infrastructures shall have a setback distance of 50 m away from all streams within the Site except for the watercourse crossings. If access tracks cross watercourses they will be constructed as clear span bridges or precast concrete culverts. No instream wet concrete operations or construction shall be permitted, and installation of any instream elements shall be completed in dry conditions. There are also 13 stream crossings proposed within the Windfarm Site. Where access tracks pass close to watercourses, silt fencing shall be used to protect the streams. The maintenance and monitoring of such silt fences shall be subject

to an on-site quality management system which is set out in the CEMP. Stream crossings shall be constructed during low flow conditions and within a 5-day weather window. The procedure for this is detailed in the SWMP. A silt fence shall be placed downstream of all works and regularly maintained. Materials used to install culverts and stream crossings shall be pre-cast.

Spoil heaps from the excavations for the turbine bases and trenches (where cables are to be buried) shall be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Any berms shall be covered with a geo-textile matting to avoid sediment runoff; berms will be surrounded by silt fencing until vegetation has been established in the following growing season. If cables will be installed in trenches, they will be located underneath and directly adjacent to access tracks as far as possible. Trenches shall be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds shall be constructed within any cable trenches at intervals.

Timing of the proposed instream works shall also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season (October–June annually), which also avoids the lamprey spawning season.

Secure concrete washout areas shall be designated Onsite. Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which should be lined and which should drain into existing or proposed drainage channels Onsite. The settlement basins shall be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities shall be provided at the Site entrance draining to silt traps. Additional silt fencing will be kept Onsite for the ongoing maintenance of the structures provided. Portaloos shall be used to provide toilet facilities for site personnel. Sanitary waste will be removed from Site via a licensed waste disposal contractor and will not be discharged on Site.

Any diesel or fuel oils stored on Site shall be bunded to 110% of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of

plant during construction will be carried out in an appropriately designed designated area, away from watercourses. Drip trays and spill kits will be kept available on Site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off Site.

6.5.7.2 Operation phase mitigation

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the Site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the Site. However, the transformers shall be bunded to over 110% of the volume of oil within them.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on Site shall be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

6.5.8 Invasive Species

While the baseline surveys did not record the presence of any Third Schedule invasive species within the site, best practice measures will be taken throughout the construction phase to prevent the introduction or spread of invasive alien species. The commencement of works will be preceded by a confirmatory survey for invasive species, especially Japanese knotweed and Gunnera species.

During construction, the following best practice measures will be implemented:

- Good construction site hygiene will be employed to prevent introduction of invasive plant species by thoroughly washing vehicles prior to entering site.
- Any soil or topsoil required on the site will be sourced only from a stock that has been screened for the presence of invasive species.
- Should the presence of an invasive species be detected, the treatment and control of same will follow guidelines issued by the National Roads Authority - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA 2010).

Implementation of the above measures will ensure that there will be no significant effect with regard to Third Schedule invasive species as a result of the proposed development.

6.6 CUMULATIVE EFFECTS

Consideration is given in the following for potential cumulative effects between the Tirawley Wind Farm project and other projects and landuse activities within the study area.

Other Wind Farm Projects

Chapter 2, Section 2.4.3 of the EIAR identified a total of 14 no. operational, consented and proposed wind farms within a 20 km radius of the site of the Wind Farm Site (see **Table 6.12** below and **Figure 2.4 in Vol III**). In addition, there are 2 no. single domestic turbines at distances of c. 1 km north of the Wind Farm Site and c. 3.5 km southeast of the Wind Farm Site. The nearest operational wind farms are the Killala Community Wind Farm (5.2 km) and Killala Community Wind Farm (Phase 1) (6.0 km). The Glenora (awaiting a planning decision) and Keerglen (awaiting a planning decision) projects are located at distances of 6.9 and 6.5 km respectively of the Tirawley Site. All the other wind farm projects are at distances greater than 10 km from the Tirawley Wind Farm Site, with the majority located within afforested and bog habitats to the southwest.

Chapter 9 (section 9.5.6.4) of the EIAR identifies the surface water catchment and sub-catchment within which these wind farms are located. The Tirawley Wind Farm Site is located in the Glencullin_SC_010 sub-catchment. Two of the wind farms (Keerglen and Glenora) are located in the Glencullin sub-catchment. However, both of these wind farms are located to the east of the Ballinglen River which acts as a hydrological barrier between the Development and these other proposed developments. Furthermore, there is 1 no. domestic wind turbine located ~1 km north of the Wind Farm Site and within the Glencullin sub-catchment. All other wind farms are located in separate catchments and have no potential for cumulative effects with the Proposed Development.

While the Tirawley Wind Farm will add a further 16 turbines to the total of 201 turbines in the 20 km review zone (excluding the Bellacorick Wind Farm turbines which are to be decommissioned), with the location of the majority of turbines in separate catchments and at distances of more than 10 km, it is considered that the Tirawley Proposed Development will not contribute to a significant effect on European sites when considered in-combination with other wind energy projects.

Other Developments

An inventory of other permitted or proposed projects (awaiting decisions) bigger than a one-off house) within a 10 km distance of the Proposed Development Site has been compiled (see **Chapter 2, Table 2.2)**. There projects are relevant to the time period between 2018

and 2025. Most of the projects are agricultural related developments or the continued use and operation of quarries and for these no potential pathways to European sites are identified. The principal larger scale projects which have received planning permission are:

- Planning Ref. 19205 granted on 24/10/2019 for an ESB substation with switch room building and the erection and operation of an asphalt mixing plant, all within an existing quarry complex.
- Planning Ref. 18358 granted on 20/12/2018 for a battery storage facility on lands within Tawnaghmore generation station.
- Planning Ref. 2012 granted on 29/06/2020 for an energy storage facility on the Killala community wind farm site.
- Planning Ref. 2360134 (granted) for a nominal 50-megawatt electricity generating station on a 19 ha site at Killala.
- Planning Ref. 2360266 (granted 27/05/2025) for a Hydrogen Plant and an Energy Centre at the existing Asahi Plant, Killala.

A series of the projects granted or under review are associated with the industrial facility at Killala, which is a distance of approximately 6 km from the site for the proposed Tirawley Wind Farm. All of these projects have been, or are, subject to rigorous evaluation of effects on the environment and especially potential for effects on European sites.

For these reasons, the Proposed Development will not contribute to any significant cumulative effect when considered in combination with other developments within the study area.

Commercial Forestry

Commercial forest operations have the potential for the release of sediment and nutrients to the aquatic environment, as well as impacts from acidification. This can ultimately have negative effect on the interests of European sites which receive the inflowing waters. The Aquatic Ecology Assessment (**Appendix 6.3**) notes that the risk of such effects would greatly increase if such works were taking place during the winter months or times of very high rainfall.

Chapter 9 (Section 9.5.6.1) of the EIAR notes that the Wind Farm Site is situated in a rural catchment which drains to the Heathfield and Cloonalaghan Rivers and the Atlantic Ocean. According to Corine land cover mapping (www.epa.ie) (2018) the cumulative study area contains several blocks of coniferous forestry. Due to the close proximity of these forested areas to the Proposed Development and given that they drain to the same watercourses as

the Proposed Development, the potential cumulative effects on downstream water quality need to be assessed. However, the mitigation measures as discussed within the present report and detailed in **Chapter 9** of the EIAR (**Section 9.5.1**, **Section 9.5.2** & **Section 9.5.3)** for the construction, operation and decommissioning phases of the Proposed Development will ensure the protection of downstream surface water quality, including the European sites associated with Killalla Bay.

For these reasons the Proposed Development will not contribute to any significant cumulative effect when considered in combination with other commercial forestry activities within the catchment.

Agriculture

Agriculture is the largest landuse activity within the study area. Agricultural operations have the potential for the release of sediment and nutrients to the aquatic environment, which can ultimately have negative effect on the interests of European sites which receive the inflowing waters.

With the strict mitigation measures, as discussed within the present report and in **Chapter 9** of the EIAR, which will be implemented during the construction, operational and decommissioning phases of the Proposed Development to ensure the protection of local watercourses, the Proposed Development will not contribute to any significant cumulative effect on European sites when considered in combination with agricultural activities within the catchment.

Table 6.12: Wind Farms within 20 km of the Wind Farm Site of the Proposed Development at Tirawley.

No.	Name	Planning Ref.	No. WTG	Direction from the Development	Approx Distance to the Development (km)	Planning Status
1	Killala Community Wind Farm (Phase 1)	17169	5	Southeast	6.0	Operational
2	Killala Community Wind Farm (Phase 2)	19260	1	Southeast	5.2	Operational
3	Lackan Wind Farm	22401	3	East	13.6	Operational
4	Oweninny (Phase 1)	ABP Ref. 16.PA0029	29	Southwest	13.9	Operational
5	Oweninny (Phase 2)	ABP Ref. 16.PA0029	31	South-west	19.6	Operational
6	*Oweninny (Phase 3)	ABP-309375-21	18	Southwest	14.3	Consented
7	Dooleeg	20467	1	Southwest	19	Consented
8	Bellacorick	901077	21	Southwest	16.8	Decommissioning*
9	Sheskin	Reg. Ref. 15/825, 19/457	8	Southwest	18.0	5 no. turbines Operational
10	Sheskin South	ABP-310529-21	18	Southwest	19.9	Consented
11	Glenora	ABP-310528-21	22	West	6.9	Awaiting Decision
12	Knockboha (Domestic)	06343	1	North	1.1	Operational
13	Leadymore (Domestic)	1769	1	Southeast	4.1	Operational
14	Gortnahurra	N/A	18	Southwest	11.7	Preplanning
15	Keerglen Wind Farm	2460537	8	Southwest	6.5	Awaiting Decision
16	Keenagh, Owenboy & Trista Windfarm	N/A	36	Southwest	22.3	Preplanning

* = Decommissioning of the Bellacorrick Windfarm will take place alongside the construction of the proposed Oweninny Phase (3)

6.7 RESIDUAL EFFECTS OF THE PROPOSED DEVELOPMENT

The strict mitigation measures which will be enforced to maintain water quality in local drains and watercourses during the Construction, Operational and Decommissioning phases of the Proposed Development (as described in the Aquatic Ecology Report (**Appendix 6.3**) and in **Chapter 9: Hydrology and Hydrogeology**) will ensure that there will be no significant residual effects on water quality or aquatic habitats or species, including otter and salmonid fish species.

As potential effects on European designated sites as a result of the Proposed Development would arise from contaminants carried within watercourses, it follows that there will be no likely significant effects on identified designated sites with hydrological connectivity with the Proposed Development site.

While the Proposed Development will result in the loss of approximately 0.68 ha of relatively intact blanket bog, an adverse effect rated as of Significance in a Local context, the loss of bog will be off-set by the implementation of the Biodiversity Enhancement and Management Plan which will preserve and enhance an area of 3.9 ha of blanket bog for the lifetime of the Proposed Development.

With mitigation measures implemented in full to minimise disturbance to high bog adjoining the work area at the wind turbine AT13 location, the significance of the disturbance effect can be reduced from a Moderate effect of medium-term duration to a Slight effect of medium-term duration.

With mitigation measures as presented implemented in full, it is considered that the significance of the predicted effect on terrestrial mammal species and amphibian and reptile species as a result of the Proposed Development will be Not Significant.

Following extensive surveys within and surrounding the site for the Wind Farm, it is considered that the landscape in which the proposed Wind Farm is situated is of moderate risk for soprano pipistrelle, Leisler's bat and common pipistrelle. With the implementation of the mitigation outlined above the potential risk of fatality from collision and/or barotrauma events to foraging and/or commuting high risk species such as pipistrelle and Leisler's have been significantly reduced, and it is concluded that the Proposed Development will not have any long-term adverse effects on the local bat populations. Impacts on other bat species have also been assessed. While these species are not at high risk from collision they can be affected by loss of connectivity features and loss of roosting sites. The Proposed

Development will see hedgerows and woodland replanted within the vicinity of the site. The newly planted areas will be connected to existing habitats creating, which will be beneficial for local bat populations.

6.8 BIODIVERSITY ENHANCEMENT

The Biodiversity and Enhancement Management Plan (BEMP) is presented in **Appendix 6.4**. The primary objective of the Plan is to preserve and enhance an area of blanket bog habitat (3.94 ha) to offset the loss of similar habitat (0.68 ha) at the wind turbine AT13 location. The BEMP will also provide mitigation for loss and disturbance to other habitats and species as a result of the Proposed Development.

The Plan area comprises the entire of an abandoned commercial quarry at Castlelackan Demesne other than the ground required to facilitate the AT16 turbine and the Site Access Track. The disused quarry, which is within the north-eastern sector of the Proposed Development site, supports relatively intact blanket bog, as well as tall willow scrub, ponds and various recolonising habitats since the quarrying activities. While a sector of the quarry will be used for peat and soil deposition derived from the Wind Farm construction works, these areas will later be incorporated into the Plan area as meadow grassland and native woodland. Overall, it is anticipated that over time the biodiversity value of the site will increase substantially for habitats and associated flora and fauna species.

The Plan is underwritten by a detailed monitoring programme, which will allow modifications to ensure that the objectives are being achieved.

6.9 PRE-CONSTRUCTION AND CONSTRUCTION PHASE MONITORING

6.9.1 Pre-Construction Bat Surveys

Should three years lapse from between the planning-stage baseline surveys and installation of the wind turbines, it will be necessary to repeat one full season of surveys during the activity period (EUROBATS, 2014). Future survey work will be completed according to best practice guidelines available (NatureScot 2021) and will include static detector, activity and roost inspection surveys.

6.9.1.1 Pre-Felling of Trees

A preliminary survey of trees within a 252 m zone of each turbine was undertaken on the 8th and 9th of March 2023 and 14th to 15th of February 2024, the correct times of year to carry out such survey. This had identified 65 trees and shrubs with a potential roost feature (PRF) (see **Appendix 6.2** for full details). It should be noted many of these trees are not now

within the zone of influence of the development and will not be impacted. All trees will require at-height surveys conducted by a suitably qualified ecologist with roost disturbance and inspection camera licences should felling or trimming be required. Should PRF's be found above ladder height the use of tree climbing / cherry pickers, scaffolding will be required in order to gain access to PRFs for detailed examination with the use of recording inspection cameras.

Surveyors shall carry out a detailed internal inspection using a torch, mirror and endoscope. Data such as internal dimensions particularly length of cavity shall be gathered. Should the removal of the roost be required at a later stage these dimensions will be vital. Should a bat roost be found a derogation licence shall be sought from the NPWS seeking permission for the roost's translocation (if possible).

Evidence of bat usage sought during the surveys should include:

- Bat droppings (these will accumulate under an established roost or under access points);
- Live bats;
- Insect remains (under feeding perches);
- Oil (from fur) and urine stains;
- Scratch marks; and
- Bat corpses.

6.9.2 Pre-Construction Otter Survey

As several years will have lapsed from the time of the planning-stage surveys (carried out in 2023-24) and the commencement of construction works at water crossings, it will be necessary to carry out a survey for otter in areas of potential suitable habitat which will be disturbed by the works as the local distribution of otter may have changed in that period. This will be carried out by an ecologist with experience of otter survey.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case otter), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

6.9.3 Pre-Construction Badger Survey

As several years will have lapsed from the time of the planning-stage surveys (carried out in 2023-24) and commencement of construction works, including tree-felling, it will be necessary to carry out a survey for badger in areas of potential suitable habitat which will

be disturbed by the works as the local distribution of badger may have changed in that period. This will be carried out by an ecologist with experience of badger survey and within the recommended period (November – March).

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case badger), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

6.9.4 Pre-Construction Amphibian Surveys

The status of the common frog and smooth newt within the ponds within the abandoned quarry at Castlelackan Demesne will be determined prior to the commencement of any construction works, including those in relation to spoil deposition.

Should the pre-construction survey indicate a requirement for protection of the relevant species, appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time. This will include removal (under licence) of spawn, tadpoles and/or adults from the pond which will be lost to one of the other ponds onsite.

6.9.5 On-going monitoring during construction

An Ecological Clerk of Works (ECoW) will be employed by the Contractor for the duration of the construction phase and will ensure that all mitigation measures relating to ecology described in this report and contained within the planning permission are implemented.

6.10 POST-CONSTRUCTION MONITORING

6.10.1 Habitats

Post-construction habitat monitoring will focus on the following:

- Blanket bog at wind turbine AT13 location which had been disturbed by construction activities;
- The newly planted hedgerows and the woodland plot;
- The Biodiversity and Enhancement Management Plan area (see details in **Appendix 6.4**).

When all ground works are complete on the bog at wind turbine AT13 location, a vegetation survey will take place by an ecologist. This will describe the state of the vegetation in the area where disturbance has occurred. A series of monitoring quadrats will be established to accurately describe the vegetation, including proportion of bare peat, at the time (Year 1) and in subsequent years. Details will be worked out by the ecologist but it is likely that

quadrats will be 2 m x 2 m in size and will be geo-referenced and photographed. Vegetation recovery will be monitored over a period as follows: Years 1, 2, 3, 5, 10, 15, 20, 25, 35. All newly planted hedging and woodland will be monitored annually for the first 10 years of the operation of the scheme. Any identified failed trees will be replaced. Repairs will be made to fencing and any specific tree wire protection as required.

Reports will be prepared for each year of monitoring and issued to the relevant planning authority.

6.10.2 Bat monitoring

Monitoring of operating wind farms is essential to increase our understanding of their potential impacts on different bat species (Rodrigues et al., 2015). Surveys for the Proposed Development shall include monitoring of mortality – this shall comprise searches from April to October for three years and every five years thereafter during the lifetime of the project. Due to the small size of bat corpses and the difficulty for detection by humans a trained sniffer dog will be employed in fatality searches. In keeping with best practice guidance, all fatality estimates will incorporate searcher efficiency and scavenger removal trials specific to the site, as well as the effect of search plot size (Rodrigues et al., 2015, Fiona Mathews, 2015). Survey frequency shall reflect results from the onsite predation levels, whilst the predation trial shall be conducted in such a way as to not be influenced by predator swarming effects, i.e. placing too many carcasses for the predation local predation level (see Smallwood, 2010).

Annual monitoring reports shall be submitted to the local authority and the NPWS. Should significant casualties be found at a particular turbine(s) additional mitigation may be required to prevent further fatalities (Wellig, 2018). The definition of significant in this respect shall reflect the most up-to-date research at the time of commencement of operation with particular reference to Eurobat guidance.

Discussion of the results of the curtailment program for turbines AT01 and AT02 will be conducted with the determining authority (involving NPWS). This will include a review of the adequacy of the monitoring effort (in light of the results) and discussion of whether turbine curtailment parameters should be varied based on any fatalities, activity and weather conditions recorded. Any variations to the mitigation will be monitored to confirm the mitigation is effective.

6.11 SUMMARY OF SIGNIFICANT EFFECTS

With the implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures which have been incorporated into the project design and into the construction, operational and decommissioning phases, in order to minimise potential significant adverse effects on water quality within the zone of influence of the Proposed Development, it can be concluded that the Proposed Development will not adversely affect the integrity of any European or National designated site.

From the perspective of terrestrial habitats, the principal significant effects as a result of the Proposed Development are: (i) the loss of 0.68 ha of relatively intact blanket bog (rated as a Significant adverse effect of permanent duration in a Local context), and (ii) the permanent loss of 1,625 m of hedgerow and 0.29 ha of scrub, as well as the temporary loss of 2,504 m of hedgerow (rated as Significant adverse effect of permanent or medium-term duration in a Local context). The effect of these losses will be offset by the implementation of the Biodiversity and Enhancement Management Plan (BEMP) and by a hedgerow and woodland replanting scheme.

With mitigation measures as presented implemented in full, including preservation of water quality in local watercourses used by otter, it is considered that the significance of the predicted impact on terrestrial mammal species and amphibian and reptile species, and on aquatic ecology (inc. fisheries), as a result of the Proposed Development will be Not Significant.

Following detailed surveys for bats within and surrounding the Wind Farm Site, and with the implementation of best practice mitigation, it is considered that the Proposed Development will have a Slight to Imperceptible residual adverse effect on the local bat populations in the area. The conservation status of each of the local bat species will remain unaffected.

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