Planning and Environmental Consultants

# Natura Impact Statement

## Sheskin South Wind Farm, County Mayo

# DOCUMENT DETAILS

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| Prepared By: | **MKO**<br>**Tuam Road**<br>**Galway**<br>**Ireland**<br>**H91 VW84** |

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# 1. INTRODUCTION

## 1.1 Background

McCarthy Keville O'Sullivan Ltd. (MKO) has been appointed to prepare a Natura Impact Statement to allow the competent authority to conduct an Appropriate Assessment under Part XAB of the Planning and Development Acts 2000-2012 of a proposed wind energy development and all associated infrastructure located at Sheskin South, County Mayo.

An Appropriate Assessment Screening Report has been prepared and is provided in Appendix 1. This Appropriate Assessment Screening Report identified the European Sites upon which the Proposed Development has the potential to result in significant effects and the pathways by which those effects may occur. The Screening Report identifies the European Sites upon which significant effects could not be excluded. Those sites will be assessed in this Natura Impact Statement.

This report has been prepared in compliance with Part XAB of the Planning and Development Acts 2000-2022. The Planning and Development Regulations 2001-2022 and relevant jurisprudence of the European and Irish courts. It has also been prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2021), European Communities (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg European Commission and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended 11 February 2010).

In addition to the guidelines referenced above, the following relevant guidance were adhered to in preparation of this report:

1. *Council of the European Commission (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. Series L 20, pp. 7-49.*
2. *European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
3. *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission.*
4. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*
5. *CIEEM (2022) Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment.*
6. *EC (2020) Guidance document on wind energy developments and EU nature legislation*

## 1.2 Statement of Authority

This report has been prepared by Inga Reich (B.Sc., Ph.D.) Colin Murphy (B.Sc., M.Sc) and Pat Roberts (B.Sc., MCIEEM). Inga Reich has over 5 years' postdoctoral experience in ecology and professional ecological consultancy. Colin is an experienced ecologist with over two years professional consulting experience. Both Inga and Colin have previous experience in preparing Biodiversity Chapters for EIARs. Pat has over 15 years' experience in ecological management and assessment. The ecological surveys were undertaken by Inga Reich and Kevin Mc Elduff (B.Sc.), Tim Murphy (BSc.), Keith Costello (BSc.), Laura McEntegart (BSc.), Cathal Bergin (BSc.) and Neil Campbell (BSc, M.Sc)).

Neil, Cathal and Keith have over 2 years of ecological consultancy experience, specialising in surveying and reporting on bat populations in Ireland. Laura has 2 years' experience in ecological assessment, also specialising in bat ecology. She has undertaken training courses with CIEEM in Bat Mitigation and Enhancement, with Wildlife Acoustics' in Kaleidoscope Pro Analysis. Laura has undertaken and assisted in ecological assessment in relation to small and large scale development projects.

# 2. CONCLUSIONS OF ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING REPORT AND SCOPE OF NIS

The Article 6(3) Appropriate Assessment Screening report identified the potential for the Proposed Development to result in significant effects on the following European Sites:

- Carrowmore Lake Complex SAC [000476]
- Slieve Fyagh Bog SAC [000542]
- Glenamoy Bog Complex SAC [000500]
- Bellacorick Bog Complex SAC [001922]
- Owenduff/Nephin Complex SAC [000534]
- Owenduff/Nephin Complex SPA [004098]

Each of these sites is discussed individually below in terms of the Qualifying Interests (QIs) and Special Conservation Interests (SCIs) with the potential to be affected and the pathways by which any such effects may occur.

## 2.1 Carrowmore Lake Complex SAC [000476]

In the absence of a surface water connection and taking the distance of the closest records of the species to the Proposed Development into account (as per Site Specific Conservation Objectives (SSCOs) (NPWS 2017a)), there is no potential for adverse effect on the following QIs:

- *Saxifraga hirculus* (Marsh saxifrage) [1528] (Map 4 of the (SSCOs)
- *Hamatocaulis vernicosus* (Slender green feathermoss) [6216] (Map 3 of the SSCOs)

### 2.1.1 Habitat deterioration

Taking a precautionary approach, a potential pathway for indirect effects in the form of habitat deterioration during the construction, operational and decommissioning phases arising from e.g. drainage or hydrological changes has been identified for the following QIs which have not been mapped:

- Blanket bogs (* if active bog) [7130]
- Depressions on peat substrates of the Rhynchosporion [7150]

On a precautionary basis, a further potential pathway for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the adjacent, proposed grid connection route was identified for the same QIs.

**The potential effect requires further assessment and will be considered below under the conservation objectives for the above listed QIs.**

## 2.2 Slieve Fyagh Bog SAC [000542]

### 2.2.1 Habitat deterioration

Taking a precautionary approach, a potential pathway for indirect effects in the form of habitat deterioration during the construction, operational and decommissioning phases arising from e.g. drainage or hydrological changes has been identified for the following QI:

- Blanket bogs (* if active bog) [7130]

On a precautionary basis, a further potential pathway for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the adjacent, proposed grid connection route was identified for the same QI.

**The potential effect requires further assessment and will be considered below under the conservation objectives for the above listed QI.**

## 2.3 Glenamoy Bog Complex SAC [000500]

In the absence of a surface water connection and taking the distance of the closest records of the habitats and species to the Proposed Development into account (as per SSCOs (NPWS 2017b), there is no potential for adverse effect on the following QIs:

- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] (Map 3 of the SSCOs)
- Machairs (* in Ireland) [21A0] (Map 3 of the SSCOs)
- *Salmo salar* (Salmon) [1106]
- *Petalophyllum ralfsii* (Petalwort) [1395] (Map 5 of the SSCOs)
- *Hamatocaulis vernicosus* (Slender green feather-moss) [6216] (Map 5 of the SSCOs)

### 2.3.1 Habitat deterioration

Taking a precautionary approach, a potential pathway for indirect effects in the form of habitat deterioration during the construction, operational and decommissioning phases arising from e.g. drainage or hydrological changes has been identified for the following QIs which have not been mapped, or are known to occur in proximity to the site boundary:

- 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]
- Natural dystrophic lakes and ponds [3160] (Map 4 of the SSCOs)
- *Saxifraga hirculus* (Marsh saxifrage) [1528] (Map 6 of the SSCOs)

**The potential effect requires further assessment and will be considered below under the conservation objectives for the above listed QIs.**

## 2.4 Bellacorick Bog Complex SAC [001922]

Due to the potential of surface water pollution of watercourses within and in the proximity of the SAC which are likely used by QI species, there is potential for adverse effect on the following QIs:

- *Vertigo geyeri* (Geyer's whorl snail) [1013]
- Natural dystrophic lakes and ponds [3160]
- Alkaline fens [7230]

### 2.4.1 Habitat deterioration

Taking a precautionary approach, a potential pathway for indirect effects in the form of habitat deterioration during the construction, operational and decommissioning phases arising from e.g.

drainage or hydrological changes has been identified for the following QIs which have not been mapped,

- Natural dystrophic lakes and ponds [3160] (Map 3 of the SSCOs – not all bog pools are mapped)
- 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]

On a precautionary basis, a further potential pathway for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the adjacent, proposed grid connection route was identified for the same QIs.

**The potential effect requires further assessment and will be considered below under the conservation objectives for the above listed QIs.**

## 2.5 Owenduff/Nephin Complex SAC [000534]

In the absence of a downstream surface water connection to these features and taking the distance of the closest records of the habitats and species to the Proposed Development into account (as per SSCOs (NPWS 2017d)), there is no potential for adverse effect on the following QIs:

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] (Map 3 of the (SSCOs)
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoteo-Nanojuncetea* [3130]
- *Saxifraga hirculus* (Marsh Saxifrage) [1528] (Map 5 of the (SSCOs)
- *Hamatocaulis vernicosus* (Slender Green Feather-moss) [6216] (Map 4 of the (SSCOs)

### 2.5.1 Habitat deterioration

Downstream surface water connectivity (about 10km surface water distance) with the SAC has been identified via the watercourses that flow from the development site into the Owenmore River and there is potential for deterioration of water quality during the construction, operational and decommissioning phases on the following QIs:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

On a precautionary basis, a potential pathway for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the adjacent, proposed grid connection route was identified for the following QIs which have not been (fully) mapped:

- Natural dystrophic lakes and ponds [3160] (Map 3 of the SSCOs – not all features are mapped)
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho*-Batrachion vegetation [3260]
- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- Alpine and Boreal heaths [4060]
- *Juniperus communis* formations on heaths or calcareous grasslands [5130]
- Blanket bogs (* if active bog) [7130]

- Transition mires and quaking bogs [7140]

### 2.5.2 Disturbance and displacement

Due to the presence of suitable habitat within and immediately surrounding the Proposed Development site and due to the close proximity of the Proposed Development and grid connection route to the SAC, there is potential for *in* and *ex situ* disturbance and displacement of this QI species within this European Site during the construction and decommissioning phases:

- *Lutra lutra* (Otter) [1355]

**The potential effects require further assessment and will be considered below under the conservation objectives for the above listed QIs.**

## 2.6 Owenduff/Nephin Complex SPA [004098]

### 2.6.1 Injury or mortality

As the Proposed Development is within the range of both species (5km for Merlin, 3-11km for Golden Plover, SNH 2016), there is potential for injury or mortality due to turbine collision during the operational phase for the following SCIs:

- Merlin (*Falco columbarius*) [A098]
- Golden plover (*Pluvialis apricaria*) [A140]

### 2.6.2 Habitat deterioration

On a precautionary basis, a potential pathway for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the adjacent, proposed grid connection route was identified for the following SCIs:

- Merlin (*Falco columbarius*) [A098]
- Golden plover (*Pluvialis apricaria*) [A140]

### 2.6.3 Disturbance and displacement

Taking a precautionary approach, due to the close proximity of the Proposed Development to the SPA, there is potential for *in* and *ex situ* disturbance and displacement for the SCI species of this European Site during the construction and decommissioning phases:

- Merlin (*Falco columbarius*) [A098]
- Golden plover (*Pluvialis apricaria*) [A140]

**The potential effects require further assessment and will be considered below under the conservation objectives for the above listed SCIs.**

# 3. DESCRIPTION OF PROPOSED DEVELOPMENT

## 3.1 Site Location

The Proposed Development site is located in Sheskin, North County Mayo, the Grid Reference coordinates for the approximate centre of the site are E 094163 N 326671.

It is approximately 2.6 kilometres north of Ballymonally, 7km north-east of Bangor Erris and 11 km south of the Atlantic (Figure 3.1). Ballycroy National Park is located about 7km to the south while Knockmoyle Sheskin Nature Reserve is 2.1km to the east. Elevation ranges between 110m above ordnance datum (AOD) in the southeast to 285m AOD in the west.

The site of the Proposed Development is located about 3km north of the N59 and is currently accessed via a local road (part of the Western Way), which runs to the east of the site as well as existing forestry tracks.

## 3.2 Characteristics of the Proposed Development

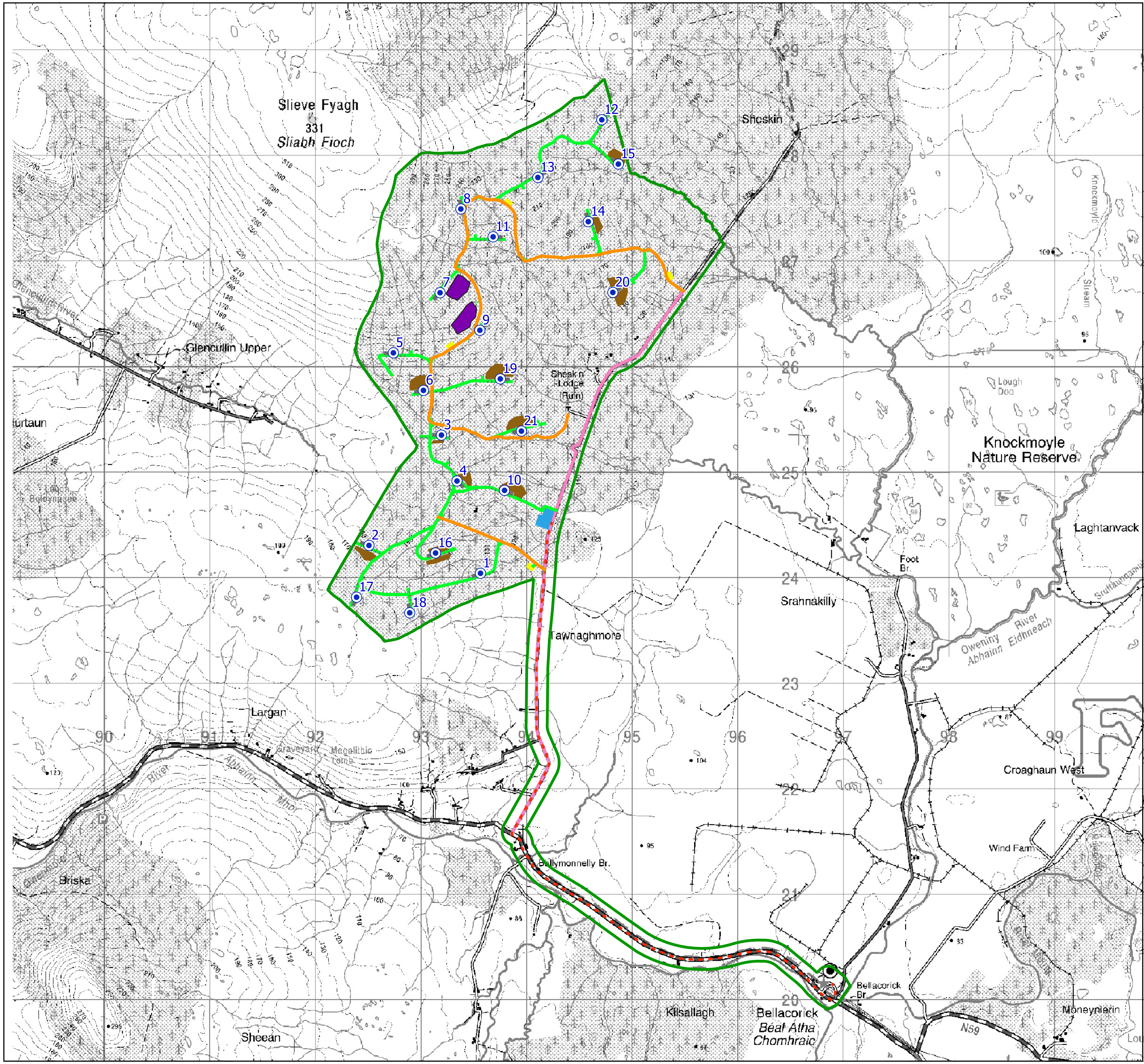
### 3.2.1 Description of the project

The Proposed Development comprises:

1. *Construction of 21 no. wind turbines and associated hardstand areas with the following parameters:*
2. *A total tip height of 200 metres,*
3. *Hub height of 115 metres, and*
4. *Rotor diameter of 170 metres*
5. *All associated underground electrical and communications cabling;*
6. *1 no. Meteorological Mast of 115 metres in height;*
7. *Upgrade of existing tracks and roads, provision of new permanent site access roads, upgrade of 2 no. existing site entrances, construction of 1 no. new site entrance;*
8. *2 no. borrow pits;*
9. *11 no. permanent peat placement areas;*
10. *4 no. temporary construction compounds;*
11. *Permanent recreation and amenity works, including marked trails, seating areas, amenity car park, and associated amenity signage;*
12. *Site Drainage;*
13. *Site Signage;*
14. *Ancillary Forestry Felling to facilitate construction and operation of the proposed development;*
15. *All works associated with the habitat enhancement and biodiversity management within the wind farm site; and*
16. *All associated site development works.*

This application is seeking a ten-year permission and 35 year operational life from the date of commissioning of the renewable energy development.

Site layout map are included as figures 2-2a and 2-2b of appendix 2 of this document.




## Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Met Mast Location
- Proposed New Roads
- Existing Roads - Upgrade Proposed
- Existing Roads - Upgrade Required (Not Proposed)
- Turbine Foundation & Crane Hardstands
- Peat Placement Areas
- Proposed Construction Compounds
- Intended Grid Connection Route
- Intended Substation Compound Location
- Proposed Borrow Pits
- Bellacorrick Substation



| | |
|---|---|
| Drawing Title: Sheskin Site Layout (Grid Connection) | |
| Project Title: Sheskin WF Development | |
| Drawn By: DOS | Checked By: EM |
| Project No.: 201119 | Drawing No.: 3-1 |
| Scale: 1:35,000 | Date: 2023-02-27 |

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

## 3.2.2 Development layout

The overall layout of the Proposed Development is shown on Figure 3.1. This drawing shows the proposed locations of the wind turbines, electricity substation, construction compounds, internal roads layout and the grid connection cabling. A detailed description of all elements of the development, including construction methodology and site layout drawings of the Proposed Development are included in Chapter 4 and Appendix 4-1 of the EIAR accompanying this application. A summary description is provided below.

## 3.2.3 Site setup

A suite of best practice environmental control and measures have been incorporated into the design of the proposed project for the construction, operation and decommissioning phase of the proposed project. Measures for the protection of water quality have been incorporated into the initial site setup phase, including the installation and management of site compounds, fuel storage areas, material storage areas are set out in this NIS along with additional mitigation measures prescribed in Section 5. These are fully described in the Construction Environmental Management Plan (CEMP), provided in Appendix 2, Section 9.4 Chapter 9 '*Water*' of the EIAR (Appendix 3) and additional measures also provided in Section 3.2.12 of this NIS. Such measures will ensure that there is no potential for water quality deterioration associated with site setup and construction.

## 3.2.4 Construction details

### 3.2.4.1 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbine foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier and a foundation area large enough to accommodate modern turbine models has been assessed in the EIAR accompanying this application. The turbine foundation transmits any load on the wind turbine into the ground.

After the foundation level of each turbine has been formed on competent strata (i.e bedrock or subsoil of sufficient load bearing capacity) or using piling methods, the bottom section of the turbine tower "Anchor Cage" is levelled and reinforcing steel is then built up around and through the anchor cage. The outside of the foundation is shuttered with temporary formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 3.1 &3.2 below). Detailed construction methodology for the turbine foundations is provided in Section 4.9, Chapter 4 of the EIAR accompanying this application.

*Plate 3.1 Turbine Base 'Anchor Cage'*

*Plate 3.2 Finished Turbine Base*

### 3.2.4.2 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base. These will facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate cranes used in the assembly and erection of the turbine. The hardstands also allow for the offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations, once completed, by placing crushed stone over the foundation. The arrangement and positioning of hard standing areas are dictated by turbine suppliers within the parameters of the planning application. This NIS has assessed the potential impacts of the hard-standing design. The proposed hard standing areas are shown on the detailed layout drawings included in Appendix 4-1 of the EIAR accompanying this application.

### 3.2.4.3 Site Roads

To provide access within the site of the Proposed Development and to connect the wind turbines and associated infrastructure approximately 7.8 kilometres of existing roads and tracks will need to be upgraded and approximately 14.2 kilometres of new access roads will need to be constructed

The 2 no. road construction types proposed are as follows:

- Existing Roads to be Upgraded
  - Excavate and Replace
- Proposed New Roads
  - Excavate and Replace

The locations where the above construction types are proposed is shown in Figure 1-1 of Fehily Timoney & Company's (FT) Peat & Spoil Management Plan. This document is included as Appendix 4-2 of the EIAR accompanying this application.

The road construction design has taken into account the following key factors:

1. *Buildability considerations*
2. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles*
3. *Minimise excavation arising*
4. *Requirement to minimise disruption to peat hydrology*

Whilst the above key factors are used to determine the road design the actual construction technique employed for a particular length of road will be determined on the prevailing ground conditions encountered along that length of road within the parameters of the planning application.

The proposed upgrade to existing roadways and construction of new roadways will incorporate passing bays (wider sections) to allow traffic to pass easily while traveling around the site. The construction methodology proposed to be used for new and existing roads across the site are included in Section 4.9.2, Chapter 4 of the EIAR accompanying this application and has been assessed in this NIS.

#### 3.2.4.3.1 *Upgrade to Existing Roads or Tracks*

The existing access tracks on site were constructed using the excavate and replace construction technique. Based on the site walkover carried out by FT the existing access tracks were typically noted as being in relatively good condition. Upgrading works will involve widening and resurfacing of the existing access track.

#### 3.2.4.3.2 *Construction of New Excavated Roads*

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat (<2.0-2.5m) provided sufficient placement/ reinstatement capacity is available on site for the excavated peat.

### 3.2.4.4 Borrow Pits

It is proposed to develop 2 no. on-site borrow pits as part of the proposed development. The borrow pits will provide the majority of all rock and hardcore material required during construction of the wind farm development. Usable rock may also be won from other infrastructure construction, including the turbine base excavations.

Borrow Pit No. 1 measures approximately 30,040m2. It is located within 35m of an existing forest road and within 35m of a proposed new road leading to Turbine No. 7.

Borrow pit No. 2 measures approximately 37,080m2 in area. It is located approximately 100m south of Borrow Pit No. 1 and is within 30m of an existing forest road and 60m of a proposed new road leading to Turbine No. 9.

Both borrow pits are shown on Figure 4-1 and on the detailed site layout drawings included as Appendix 4-1 to the EIAR accompanying this application.

### 3.2.4.5 Electricity Substation and Control Building

It is intended to construct a 110kV electricity substation within the site of the Proposed Development. The intended substation site is located within forestry, adjacent to the southeastern boundary of the wind farm development site, adjacent to an existing forestry road which runs north to south along the eastern boundary of the site.  Access to the substation will be off the existing road.

The footprint of the onsite electricity substation compound measures approximately 21,500m$^2$ and will include 2 no.  wind farm control buildings and the electrical components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the wind farm to the national grid. ]

Two wind farm control buildings will be located within the substation compound. The Independent Power Provider (IPP) Control Building will measure 20.1 metres by 10.7 metres and 6.9 metres in height. It will be located at the western edge of the substation compound. The Eirgrid Control Building will be located towards the centre of the substation compound and will measure 25 metres by 18 metre and 8.4 metres in height.

#### 3.2.4.6 Site cabling

Each turbine will be connected to the on-site electricity substation via an underground 33/66kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building at the onsite substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in trenches that will be approximately 1.3 metres in depth and 0.6metres in width, within the wind farm access roadways. The route of the cable ducts will follow the access track to each turbine location.

### 3.2.5 Grid Connection Cabling

A 110kV connection between the Proposed Development and the national electricity grid will be necessary to export electricity from the proposed wind farm. This underground cable connection will originate at the proposed onsite substation located within the south-eastern corner of the site, adjacent to an existing forestry road. The underground cable connection will run southwards from the substation along the existing forestry road for approximately 2.1km before meeting the L52926 road in the townland of Tawnaghmore.

The proposed grid connection cabling route will then continue south along the L52926 for approximately 1km before turning east onto the N59 National Route. The cabling route will then head in a westerly direction along the N59 for approximately 3.6km passing through the townlands Killsallagh and Bellacorick before turning north on to the L-52925 local road and then west (approx. 200m)into the existing 110kV Bellacorick substation in townland of Bellacorick. The grid connection cabling route measures approximately 6.9 kilometres in length

### 3.2.6 Meteorological Mast

One permanent meteorological (met) mast is proposed as part of the Proposed Development. The met mast will be equipped with wind monitoring equipment at various heights. The mast will be located E492700, N825934 as shown on the site layout drawing in Figure 4-1 of the EIAR accompanying this application. The mast will be a slender structure and will be 115m in height. The mast will be a free-standing structure. The mast will be constructed on a hard-standing area sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to an existing track.

### 3.2.7 Tree felling

The majority of the site (964 hectares/81%) currently comprises commercial coniferous forestry plantation. As part of the Proposed Development, tree felling will be required within and around the development footprint to allow the construction of turbine bases, access roads and the other ancillary infrastructure.

A total of 117 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development in order to facilitate infrastructure construction and turbine erection. Figure 4-18 shows the extent of the areas to be permanently felled as part of the Proposed Development.

The tree felling activities required as part of the Proposed Development will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the

Proposed Development be submitted with the felling licence application; therefore, the felling license cannot be applied for until such time as planning permission is obtained for the Proposed Development.

## 3.2.8 Temporary Construction Compounds

Four temporary construction compounds measuring approximately 45 metres by 70 metres and 3,100m$^2$ in area are proposed as part of the wind farm development.

- Compound No. 1 is located along an existing road approximately 100m west of the main site entrance south of the intended onsite substation. (Primary Construction Compound)
- Compound No. 2 is located along an existing road within 300m of Turbine No. 9 and within 130m of Borrow Pit No.2.
- Compound No. 3 is located along an existing road within 350m of Turbine No. 13
- Compound No. 4 is located along an existing road within 140mof the northern.

## 3.2.9 Recreation and Amenity Proposal

### 3.2.9.1 Visitor Entrance and Car Park

Access to the site for visitors during the operational phase, will be via the proposed upgraded entrance off the existing forest road which runs adjacent to the northern site boundary in the townland of Sheskin. The proposed upgraded entrance will have adequate visibility splays for safe access and egress for passenger vehicles or cyclists.

It is proposed repurpose the construction compound nearest the main site entrance for use as a visitor car park for recreational users of the area. At the end of the wind farm's construction, the surface dressing of a portion of the construction compound will be upgraded to provide a level, compacted car park surface. It is not intended to delineate individual car parking spaces, however there will be sufficient space to safely accommodate up to 24 vehicles. A suitably sized hydrocarbon interceptor and grit trap will be installed as part of the drainage system for the car park.

### 3.2.9.2 Amenity Walkways

It is proposed to create dedicated marked trails and walking loops for walkers, cyclists, trail runners and general outdoor recreation. All trails and loops will make use of the proposed wind farm site road network and no additional tracks are required to be constructed. The Glencullin Loop comprises an approximate 5km walking loop through the site complete with benches and information posts. The amenity carpark will be located at the start of this loop. The more challenging Sliabh Fyagh Loop comprises 9km of walking trails taking in the views of Sliabh Fyagh and will also include benches, signposts and viewing areas. Both links will link up to the existing Western Way which runs along the eastern side of the site

### 3.2.9.3 Viewing Point

The hardstanding area at Turbine No. 8 is proposed as a viewing point of the surrounding landscape and wind farm. The is the most elevated of the proposed turbine locations. The viewing point will comprise a labelled panorama photograph of the available view, a seating area and information signage highlighting the heritage of the wider area and the importance of renewable energy.

## 3.2.10 Site Drainage

The drainage design for the Proposed Development has been prepared by CDM Smith, and by the firm's principal, Mr Jon Hunt/Henning Moe. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Development. The Proposed Development's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the Proposed Development and turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones of 50m around rivers and streams, respectively, have been used to inform the layout of the Proposed Development

The routes of any natural drainage features will not be altered as part of the Proposed Development. Turbine locations have been selected to avoid natural watercourses. Up to 8 no. new watercourse crossings and 9 no. potential crossing upgrades will be required as part of the Proposed Development. There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Development and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains must be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

Details of all proposed drainage measures incorporated into the Proposed Development are fully described in Section 4.7, Chapter 4 of the EIAR, Section 9.3.3, Chapter 9 'Water' (Appendix 3) and Section 3.2 of the CEMP, Appendix 2 of this NIS.

## 3.2.11 Peat Management

The management of excavated peat and overburden and the methods of placement and/or reinstatement are described in detail in FTC's *Peat and Spoil Management Plan* in Appendix 4-2 of the EIAR for this application.

## 3.2.12 Proposed Clear-span Watercourse/Service Crossing

There are a number of natural watercourse and a Gas Networks Ireland pipeline (service) within the site of the Sheskin South Wind Farm development.

It is proposed to construct clear-span crossings watercourse/service crossings along the wind farm access roads at 11 no. locations using a bottomless box culvert. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 of the EIAR accompanying this application. The clearspan watercourse/service crossing methodologies presented below will ensure that no instream works are necessary.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

The service crossings will be constructed in accordance with Gas Networks Ireland Code of Practice 2021. These crossing designs will be approved by GNI before works commence on site.

Confirmatory inspections of each proposed new watercourse crossing location will be carried out by the project civil/structural engineer and the project hydrologist prior to the construction of each crossing.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within suitable backfill material

## 3.3 Operation

The Proposed Development is expected to have a lifespan of approximately 35 years. Planning permission is being sought for a 35-year operation period commencing from the date of full operational commissioning of the wind farm. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to an off-site control centre. Each turbine will also be monitored off-site by the wind turbine supplier. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation components and site tracks will also require periodic maintenance.

## 3.4 Decommissioning

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 35 years. Following the end of the operational life of the wind farm, the wind turbines may be retained and the operational life extended or replaced with a new set of turbines, subject to planning permission being obtained. In the event that neither of the above options are implemented, the Proposed Development will be decommissioned fully as agreed with the Planning Authority. The onsite substation will remain in place as it will be under the ownership of the ESB and will form a permanent part of the national electricity grid.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and will be covered with earth and reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Site roadways will be left in situ, for future forestry operations. The amenity and recreation infrastructure will also be left in-situ. Underground cables, including grid connection, will be removed and the ducting left in place.

# 4. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

The ecological surveys that were undertaken to inform this NIS are fully described in this section. A general description of the ecology of the site of the Proposed Development is provided in the AA Screening Report in Appendix 1. The specific surveys that were undertaken to assess the potential effects on the identified European Sites are described below.

## 4.1 Methodologies

### 4.1.1 Desk Study methodology

The desk study undertaken for this assessment included a thorough review of available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA (Envision), Water Framework Directive (WFD), Geological Survey of Ireland (GSI) & Inland Fisheries Ireland (IFI).
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper.
- Data on potential occurrence of protected bryophytes – as per NPWS online map viewer; Flora Protection Order Map Viewer – Bryophytes[1].
- IFI Reports.
- Review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed Development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files

### 4.1.2 Scoping and Consultation

MKO undertook a scoping exercise during preparation of this NIS and associated planning application documentation, as fully described in Chapter 2, Section 2.6 of the accompanying EIAR.

Copies of all scoping responses are included in Appendix 2-1 of the accompanying EIAR. The recommendations of the consultees have informed the EIAR preparation process and the contents of this NIS. The comments raised in the scoping responses received have been addressed in this NIS.

A data request was sent to the NPWS Scientific Data Unit, and a response was received on the 27th of May 2021. The only species recorded that were also QIs of any potentially impacted SACs were slender green feather moss (*Hamatocaulis vernicosus*), marsh saxifrage (*Saxifraga hirculus*) and otter (*Lutra lutra*).

In addition to the above, two meetings were held with the with the National Parks and Wildlife Service to discuss the Ecological and Ornithological aspects of the Proposed Development.

The first meeting with NPWS was held on 24th September 2022 via a MS Teams call with representatives from MKO, SSE and NPWS to introduce the project.

[1] *NPWS, 2020, Online map viewer; Flora Protection Order Map Viewer – Bryophytes. Online, Available at: http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e, Accessed: 24/03/2020.*

Matters discussed included:

- Site Location and habitat maps
- Surveys – flora and fauna observations on site, habitats, surveys undertaken, surveys ongoing and surveys upcoming
- Main ecological considerations
- Scoping
- Construction Environmental Management Plan (CEMP)

A second meeting was held on 26th January 2022 via a MS Teams call with representatives from MKO, SSE, MWP and NPWS. The meeting commenced with a run-through of the previous meetings by MKO which was held on 24th September 2021 and the follow up items which were issued to NPWS post meeting.

Matters discussed included:

- Bio enhancement plans including bog rehabilitation and species mortality.
- Ornithological matters
- The proposed grid connection and the consideration for loss of habitat due to clearfelling

### 4.1.3 Ecological Survey Methodologies

A comprehensive survey of the biodiversity of the site was undertaken on various dates in 2021 and 2022. The following sections fully describe the ecological surveys that have been undertaken and provide details of the methodologies, dates of survey and guidance followed.

#### 4.1.3.1 Multi-disciplinary Walkover Surveys

Multidisciplinary walkover surveys, in accordance with TII guidelines on *Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes* (TII, 2009), were undertaken within the EIAR Site Boundary on the following dates:

- 4th August 2021
- 10th August 2021
- 18th August 2021
- 2nd September 2021
- 24th September 2021
- 18th January 2022
- 21st January 2022

All surveys of vegetation were completed within the optimum period for vegetation surveys/habitat mapping, i.e. April to September (Smith *et al.*, 2011). A comprehensive walkover of the entire EIAR Site Boundary was completed.

The walkover surveys were also designed to detect the presence, or likely presence, of a range of protected species. The survey included a search for badger setts and areas of suitable habitat, potential features likely to be of significance to bats and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the Proposed Development (e.g. otter etc.). In addition, an inventory of other species of local biodiversity interest was compiled including invertebrates (butterflies, dragonflies, damselflies, beetles), plants, fungi etc.

The multi-disciplinary walkover surveys comprehensively covered the entire EIAR Site Boundary for features and locations of ecological significance. Based on the multi-disciplinary walkover survey findings, further detailed targeted surveys were carried out during follow-up species specific survey visits. These are described in detail below. These surveys were carried out in accordance with TII guidelines on *Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes* (TII, 2009b).

During the multidisciplinary surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted.

Other targeted survey methodologies undertaken at the site are described in the following subsections.

#### 4.1.3.2 Dedicated Habitat and Vegetation Composition Surveys

Habitats within the site were classified according to the guidelines set out in 'A Guide to Habitats in Ireland" (Fossitt, 2000), which classifies habitats based on the vegetation present and management history. Vegetation was sampled by taking botanical quadrats/relevés within representative habitat areas of the site. This allowed for accurate habitat classification. The location of each of the quadrats and the quadrat data is provided in Appendix 6-1 of the EIAR. The extent of each habitat on site was mapped on site using aerial photography, hand held GPS and smartphone technology. A representative photograph was also taken for each of the habitats recorded on site, including all relevés.

Habitats, such as peatlands recorded within the site, likely to correspond to EU Habitats Directive Annex I habitat types have been described and assessed in accordance with NPWS guidance from the relevant national Annex I habitat surveys/ Irish Wildlife Manuals. Where applicable, vegetation communities were also classified for habitats, in particular Annex I habitats, according to the Irish Vegetation Classification (IVC) system (Perrin, 2015[2]).

The habitat assessment surveys described in this report, including EU Habitats Directive Annex I classification and condition assessment, have been undertaken in accordance with the following guidelines and interpretation documents:

- Perrin, P.M, Martin, J.R., Barron, J.R., Roche & O'Hanrahan, B. (2014) *Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland.* Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service.
- O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
- Martin, J.R., O'Neill, F.H. & Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- NPWS (2019), The Status of EU Protected Habitats and Species in Ireland. Volume 2: *Habitat Assessments*. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill
- NPWS (2013), The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Commission of the European Communities (2007) Interpretation manual of European Union habitats. Eur 27. European Commission DG Environment.

Habitats considered to be of ecological significance and in particular having the potential to correspond to those listed in Annex I of the EU Habitats Directive 92/43/EEC (as amended) were identified and classified as KERs.

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[2] *Perrin, P.M., (2015) The Irish Vegetation Classification – Technical Progress Report No. 1, Online, Available at:* http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Irish-Vegetation-Classification_Technical-Progress-Report-No.1-1.pdf *Accessed January 2022.*

Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2010), while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010).

### 4.1.3.3 Terrestrial Fauna Surveys

The results of the desk study, scoping replies and incidental records of protected species recorded during multidisciplinary walkover surveys were all used to inform the scope of targeted ecological surveys required. Based on these findings dedicated surveys for bats, otter and badger were undertaken at the times set out below following the methodologies also provided below. During the multidisciplinary walkover surveys, records of invertebrates including butterflies, damselflies, dragonflies, moths, beetles etc. were recorded. As suitable marsh fritillary habitat was identified following initial site visits and based on records in the wider area following the desk study, dedicated marsh fritillary butterfly surveys were deemed necessary. Following the completion of ecological walkover surveys, no requirement for additional dedicated faunal surveys was identified

#### 4.1.3.3.1 *Otter Survey*

Following a review of the initial site walkover ecological surveys for constraints identification and the results of the multi-disciplinary walkover survey; areas identified as providing potential habitat for otter were subject to specialist targeted survey. The otter survey of watercourses was conducted on the 4th, 10th and 18th August 2021 and on the 18th and 21st January 2022. Additional otter surveys were undertaken during a fisheries assessment of the watercourses both within and downstream of the site boundary in September 2021.

The otter surveys were conducted as per TII (2009b) guidelines (*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*). This involved a search for all otter signs e.g. spraints, scat, prints, slides, trails, couches and holts at crossing points including the grid connection (including a distance of 100m either side of the crossing points) and along the entire length of watercourses where they run parallel to proposed infrastructure. In addition to the width of the rivers/watercourses, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat (NPWS 2009). The dedicated otter surveys also followed the guidance as set out in TII (2008b) *Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes* and following CIEEM best practice competencies for species surveys (CIEEM, 2013).

#### 4.1.3.3.2 *Bird Surveys*

Extensive bird surveys were undertaken to inform the EIAR and have been reviewed in the preparation of this NIS. As fully described in the Bird Impact Assessment Report prepared by Malachy Walsh and Brian Madden (appendix 7-1) accompanying EIAR for the proposed development, dedicated bird surveys were undertaken in accordance with industry standard best practice i.e. Scottish Natural Heritage (2017) 'Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage'.

The field surveys comprised two main elements: vantage point (VP) watches to gather flight activity data for target species, and targeted distribution and abundance surveys to gain an understanding of bird species occurring in the area which may be subject to impacts from the development.

The targeted distribution and abundance surveys comprised the following elements:

- Transect and Point Count surveys
- Winter Season Hinterland surveys
- Breeding Season Hinterland surveys
- Hen harrier (*Circus cyaneus*) Winter Roost surveys
- Winter Season Walkover surveys

- Breeding Season Walkover surveys

Full details are presented in the relevant survey reports, available in appendix 7-1 of the EIAR accompanying this application.

VP surveys were carried out with regard to 'Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2017), on a monthly basis by suitably qualified personnel for the winter and breeding seasons (October 2019 to September 2022, inclusive).

VP surveys are on-going at the site and are due to continue into the winter 2022/23 and summer 2023 bird survey seasons.

VP locations were selected to provide maximum site coverage. Several factors limited selection of VP locations including the forested nature of the site, site topography, and the health and safety risks associated with the open moorland and lake habitats surrounding much of the site. Six VP locations were selected and surveyed over the course of the winter and breeding seasons. The location of VP6 was revised in December 2019 to achieve greater visibility of the survey area. The current location of VP6 has remained unchanged since then.

In April 2022, the location of VP1 had to be temporarily moved due to difficulties in gaining access to the VP, located in the neighbouring Oweninny Wind Farm. An alternative location for VP1 was selected to the south of the Proposed Development site. This revised VP1 location was used for a five-month period until access issues were rectified, after which the original VP1 location was used again from September 2022 onwards. More than the 2-year SNH recommended minimum VP survey period was achieved at the original VP1 location.

The Irish Transverse Mercator (ITM) grid co-ordinates for each VP location are provided in Table 2 below. Maps showing the locations of each VP and the viewsheds from each VP in order to show the extent of site coverage are provided in appendix 7-1 of the EIAR accompanying this application.

*Table 4-1. VP locations at the site and the minimum VP survey effort achieved at each VP Location*

| Vantage Point | ITM Grid Coordinates | Survey period covered consecutively to date | Minimum VP Survey Effort |
|---|---|---|---|
| 1 (original) | 495662 824760 | Oct 2019 – March 2022 incl.; Sept 2022 | 31 months |
| 1 (temporary) | 494089 823306 | April 2022 – August 2022 incl. | 5 months |
| 2 | 492457 825285 | Oct 2019 – September 2022 incl. | 36 months |
| 3 | 493120 828233 | Oct 2019 – September 2022 incl. | 36 months |
| 4 | 493942 831479 | Oct 2019 – September 2022 incl. | 36 months |
| 5 | 494241 829412 | Oct 2019 – September 2022 incl. | 36 months |
| 6 | 495334 826541 | Jan 2020 – September 2022 incl. | 33 months |

## Distribution and abundance surveys

A variety of distribution and abundance surveys were carried out to record numbers and distributions of local and migrant bird species using the site or surrounding area that might be affected, either directly or indirectly, by the proposed development.

**Transect survey**

A transect survey is a survey along a defined route within the survey area. The overall aim of the transect surveys was to assess general bird distribution throughout the site and gather data on bird usage of the site. Three transects Transect A (TA), Transect B (TB) and Transect C (TC) were carried out in various months across the overall survey period, as follows:

*Table 4-2. Transect survey months.*

| Survey Period | Corresponding Transect Survey Months |
|---|---|
| **Winter 2019/20** | November 2019, January and February 2020 |
| **Winter 2020/21** | October, November, December 2020, January, February and March 2021 |
| **Winter 2021/22** | October, November and December 2021, January, February and March 2022 |
| **Breeding 2020** | June, August and September 2020 |
| **Breeding 2021** | April, May, June, July, August and September 2021 |
| **Breeding 2022** | April, May, June, July, August and September 2022 |

All bird species seen or heard, typically within 100 m of the transect routes, were recorded, although the topography of the landscape often allowed for detection of birds at greater distances. The transect routes were selected to provide representative coverage of all habitats, both open and closed, occurring within the site, comprising mainly mature forestry and clearfell. Birds were also surveyed during each transect using point count (PC) methodologies. Transect A encompassed three PC locations (PC1-PC3), Transect B encompassed eight PC locations (PC1- PC8) and Transect C encompassed five PC locations (PC1- PC5).

**Winter Hinterland Survey**

Winter hinterland surveys were undertaken to identify areas of importance for target species in the locality, with a particular focus on large assemblages of wintering wildfowl and waders. Counts were undertaken at selected sites considered to be of importance for wintering waders and other waterbirds within a 20 km radius of the Proposed Development site. Counts were undertaken in various months during the winter 2019/20, winter 2020/21 and winter 2021/22 seasons at several locations which included Carrowmore Lake, Sruwaddacon Bay, Traw Kirtaun/Barr na Trá Bay, Lough Nahelly and Lough Dahybaun. These are briefly described in the following table.

*Table 4-3. Winter Hinterland Survey*

| Winter Hinterland Survey Site | Location | Brief Description |
|---|---|---|
| **Lough Dahybaun** | 6.6 km to south-east of wind farm site | Encompassed within Lough Dahybaun SAC (002177) (refer to Section 3.2.1 below). |
| **Carrowmore Lake** | 7.4 km west of wind farm site | Encompassed within Carrowmore Lake SPA (004052) designated for Sandwich Tern (*Sterna sandvicensis*), and Carrowmore lake Complex SAC (000476) (refer to **Section 3.2.2** below). |
| **Sruwaddacon Bay** | 10.2 km northwest of wind farm site | Encompassed within Blacksod Bay/ Broad Haven SPA (004037). Designated for variety of wader and waterbird species. Also encompassed within Glenamoy Bog Complex SAC (000500) (refer to **Section 3.2.2** below). |
| **Traw Kirtaun/Barr na Trá Bay** | 13.8 km to west of wind farm site | Encompassed within Blacksod Bay/ Broad Haven SPA (004037). Designated for variety of wader and waterbird species. Also encompassed within Broadhaven Bay SAC (000472) (refer to **Section 3.2.2** below). |
| **Lough Nahelly** | 17.9 km west of wind farm site | Encompassed within Blacksod Bay/ Broad Haven SPA (004037). Designated for variety of wader and waterbird species. Also encompassed within Mullet/ Blacksod Bay Complex SAC (000470) (refer to **Section 3.2.2** below). |

### Breeding Season Hinterland Survey

Driven transects, encompassing the area out to and extending beyond a 5 km radius of the site, were undertaken on the 12th May, 30th of June 2021 and the 26th September 2022.. The purpose of these surveys was to identify any potential areas of interest for breeding waterbirds and birds of prey and record evidence of breeding activity, if any.

### Hen Harrier Winter Roost Survey

An initial winter roost survey for hen harrier was undertaken in January 2020 at a roost-site at Lough Dahybaun, located approximately 7.5 km south-east of the development site. From the commencement of the winter 2020/21 survey season, surveys for roosting hen harrier were undertaken during the winter months at this location on a monthly basis. Surveys had regard to O'Donoghue (2019). Surveys commenced before sunset and continued until visibility was lost. Winter roost watches at Lough Dahybaun were conducted on the following dates:

*Table 4-4. Hen harrier winter roost survey months*

| Survey Period | Corresponding Survey Months |
|---|---|
| Winter 2019/20 | 29th January 2020 |
| Winter 2020/21 | 12th October, 11th November and 8th December 2020, 20th January, 22nd February and 19th March 2021 |
| Winter 2021/22 | 5th October, 23rd November, 25th November and 18th December 2021, 17th January, 22nd February and 21st March 2022 |

Please note, this survey area is located outside the ZOI of the Proposed Development.

### Winter Walkover Surveys

Walkover surveys were carried out with a focus on red grouse (*Lagopus lagopus hibernicus*), merlin and golden plover throughout the winter of 2019, 2020, 2021 and 2022. Details on the surveys carried out including survey dates, times and weather conditions and the results can be found in in Appendix 7-1 of the EIAR accompanying this application.

### Breeding Season Walkover surveys

Breeding season walkover surveys were undertaken to determine the presence of target species within areas of potentially suitable habitat within the study area. The methodologies were broadly based on methods described in Bibby et al., (2000) and Gilbert et al., (1998). All target and secondary species were recorded, with a focus on woodcock, red grouse, merlin and other raptors, golden plover and other moorland breeding species such as snipe and dunlin. Breeding season walkover routes were primarily located within the 500 m survey area extending out from the site boundary, and sometimes extending beyond this area, in line with the SNH (2017) guidance on a minimum 500 m main breeding bird survey area.

### Breeding Season 2020

Nocturnal walkover surveys for breeding nightjar (*Caprimulgus europaeus*) and woodcock (*Scolopax rusticola*) were carried out on the 11th of June 2020 between 23.00 and 01.10 to record any potential breeding activity. Two separate walkover routes (A & B) were utilised within areas of suitable breeding habitat within the Proposed Development site. Surveyors slowly walked the transect routes while recording any displaying and/or calling male birds.

### Breeding Season 2021

Walkover surveys, with a focus on red grouse, merlin and golden plover, were carried out on the 12th May and 9th July 2021. Two survey routes encompassing areas of suitable habitat, partially located within the 500m survey area, were utilised. Any birds seen or heard as surveyors walked along the survey routes were recorded. A nocturnal walkover survey for breeding woodcock and nightjar was carried out on the 2nd June 2021 between 22.30 and 23.50 to record any potential breeding activity. One walkover route was used which utilised existing internal forestry access tracks within the Proposed Development site, as well as the trackway bounding the eastern perimeter of the Proposed Development site.

**Breeding Season 2022**

A nocturnal walkover survey for breeding woodcock and nightjar was carried out on the 20th June 2022 between 21.45 and 23.15 to record any potential breeding activity. The same nocturnal walkover survey route as was used in 2021 was utilised in 2022.

Following a pre-application consultation with NPWS in January 2022, an additional survey targeting moorland breeding birds was undertaken in the area of bog to the west of the proposed wind farm site during the 2022 breeding season. This survey had a particular emphasis on golden plover and other breeding waders in this area with a focus on expanding upon the results of the 2018 NPWS survey undertaken on breeding waders on the Slieve Fyagh SAC Plateau (NPWS, 2018 unpublished report), located to the north-west of the development site.

The survey methodology employed in the 2022 breeding season was based on an adapted Brown and Shepherd (1993) survey method for moorland breeding birds and had regard to the methodology employed during the 2018 NPWS survey. The 2022 survey comprised four separate survey visits. Visits were undertaken on the following dates: 4th May, 21st May, 14th July and 21st July 2022. No visits were undertaken in either April or June 2022 due to survey constraints, as described in appendix 5.

On a precautionary basis, the survey area was extended to 1 km from the site boundary, exceeding the 500 m survey area buffer typically employed for such surveys. During each visit, four parallel transects were walked. The surveyors walking the transect routes surveyed an area encompassing 125 m to either side of each transect, recording the locations and activity of breeding birds within the survey corridor. Therefore, all areas of suitable habitat within 125 m were walked, out to a maximum distance of 1 km from the development boundary.

#### 4.1.3.3.3 *Invasive species survey*

During the multi-disciplinary walkover surveys, a search for non-native invasive species was undertaken. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended) (S.I. 477 of 2015).

## 4.2 Desk Study Results

### 4.2.1 Carrowmore Lake Complex SAC [000476]

#### 4.2.1.1 Review of Conservation Objectives

The relevant QIs and the associated conservation objectives of the site are presented in Table 4-5. The Targets and Attributes for the relevant habitats, as described in the SSCOs (NPWS 2017a) were reviewed and considered in this assessment.

*Table 4-5Qualifying Interests and Conservation Objective (Version 1, 2017a)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Blanket Bogs (*if active bog) [7130] | To restore the favourable conservation condition of this habitat in Carrowmore Lake Complex SAC |
| Depressions on peat substrates of the Rhynchosporion [7150] | |

### 4.2.1.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the proposed development. These are provided in Table 4-6. 'Roads, motorways' is loosely associated with the proposed development.

*Table 4-6 Site-specific threats, pressures and activities with potential to effect on the SAC*

| Negative Impacts | | | |
|---|---|---|---|
| **Rank** | **Threats and pressures [code]** | | **Inside/outside/both** |
| M | A04 | Grazing | b |
| M | B01 | Forest planting on open ground | o |
| L | B01 | Forest planting on open ground | i |
| L | C01.03.01 | Hand cutting of peat | o |
| M | C01.03.01 | Hand cutting of peat | i |
| M | C01.03.02 | Mechanical removal of peat | b |
| L | D01.01 | Paths, tracks, cycling tracks | i |
| L | D01.02 | Roads, motorways | o |
| L | E01.03 | Dispersed habituation | o |
| L | F02.03 | Leisure fishing | i |
| L | I01 | Invasive, non-native species | i |

Rank: H = high, M = medium, L = low; i = inside, o = outside, b = both

### 4.2.1.3 *Annex I habitats of Carrowmore Lake Complex SAC*

The Qualifying Interests with the potential to be affected via the identified pathway include:

- Blanket bogs (* if active bog) [7130]
- Depressions on peat substrates of the Rhynchosporion [7150]

#### 4.2.1.3.1 *Blanket bogs (* if active bog) [7130]*

Blanket bog has not been mapped in detail for Carrowmore Lake Complex SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 2,285ha, covering 63% of the SAC (NPWS internal files). Blanket bog habitat lies east of Carrowmore Lake. Three large areas of blanket bog are incorporated into the SAC at Glenturk, Carrowmore (or Glencullin) and Largan More.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): This QI habitat occurs in areas of consistently high rainfall (>1,250mm and >225 rain days per annum) where the ground surface is waterlogged for much of the time, resulting in the development of deep peats. The habitat is widespread along the western seaboard and on uplands, but absent from lowlands in the midlands and east. It may be broadly divided into upland and lowland types. The peat is typically more than 50cm deep, c. 1-2m in uplands but up to 8m in lowlands. Blanket bog generally occurs on flat or gently sloping terrain but can occur on steeper ground in the wettest districts. Both active and inactive blanket bog qualify as the Annex I habitat. The former is a priority Annex I habitat and supports significant areas of peat-forming vegetation, e.g. *Sphagnum* spp., cottongrasses (*Eriophorum* spp.), black bog-rush and white beaksedge. Areas are classed as inactive bog if they have few peat-forming species, e.g. eroded bog recolonised with swards of common cottongrass (*Eriophorum angustifolium*). The conservation assessment presented here is for the combined classes, active and inactive. The main pressures on blanket bogs are overgrazing, burning, afforestation, peat extraction, and agricultural activities causing nitrogen deposition. Erosion, drainage and wind farm construction are other issues of concern. As a result the Overall Status is assessed as Bad and deteriorating, unchanged since the 2013 report.

#### 4.2.1.3.2 *Depressions on peat substrates of the Rhynchosporion [7150]*

Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for Carrowmore Lake Complex SAC and thus the total area of the qualifying habitat is unknown. This habitat is scattered throughout the blanket bog in the SAC. It is best developed in areas of deep, quaking peat and around pools (Douglas et al., 1989; NPWS internal files).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): This QI habitat is characterised by the presence of *Rhynchospora alba* and *R. fusca*, is considered to be an integral part and microhabitat of active raised bog and blanket bog. In raised bogs, *Rhynchospora* vegetation communities are considered to qualify as the Annex I habitat when they occur in their most developed form in the wettest sections of active raised bogs, corresponding with pools, *Sphagnum* lawns and hollows. This habitat is also an integral part of blanket bogs and can also be found in poor fens / flushes and transition mires occurring in close association with blanket bog. Only when the *Rhynchospora* species are associated with plant communities of the most sensitive and undisturbed parts of blanket bog and associated wetland habitats are they considered to correspond with the Annex I habitat. Such areas include small depressions or flushed areas, extensive water tracks and interconnecting shallow pool areas around hummocks of *Sphagnum*, pool margins, and low-level flats or lawns that often form an interface between hummocks and bog pools. *Rhynchospora* vegetation communities in more disturbed situations on degraded raised bog and blanket bog (e.g. tracks, cutover peat, areas overgrazed and trampled by livestock) have a depauperate species assemblage and lack other indicative species such as abundant Sphagnum species and great sundew (*Drosera anglica*). Although formerly regarded as the Annex I habitat, this vegetation is no longer considered to correspond with the habitat in Ireland. The main pressures on the habitat are associated with impacts on the supporting bog habitats, especially overgrazing, burning, peat extraction, drainage and conversion to forestry. The Overall Status of the habitat is therefore assessed as Bad and deteriorating.

## 4.2.2 Slieve Fyagh Bog SAC [000542]

The relevant QI and the associated conservation objectives of the site are presented in Table 4-7. The Targets and Attributes for the relevant habitat, as described in the SSCOs (NPWS 2016) were reviewed and considered in this assessment.

#### 4.2.2.1 Review of Conservation Objectives

*Table 4-7 Qualifying Interests and Conservation Objective (Version 1, 2016)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Blanket Bogs (* if active bog) | To restore the favourable conservation condition of this habitat in Slieve Fyagh SAC |

#### 4.2.2.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SPA were reviewed and considered in relation to the proposed development. These are provided in Table 4-8. 'Roads, motorways' is loosely associated with the proposed development.

*Table 4-8 Site-specific threats, pressures and activities with potential to effect on the SPA*

| Negative Impacts | | | |
|---|---|---|---|
| Rank | Threats and pressures [code] | | Inside/outside/both |
| H | A04 | Grazing | b |
| H | B01 | Forest planting on open ground | o |
| L | C01.03.01 | Hand cutting of peat | b |
| L | C01.03.02 | Mechanical removal of peat | b |
| L | D01.02 | Roads, motorways | o |
| L | E01.03 | Dispersed habituation | o |
| H | K01.01 | Erosion | i |

*Rank: H = high, M = medium, L = low; i = inside, o = outside, b = both*

#### 4.2.2.3 *Annex I habitats of Slieve Fyagh Bog SAC*

The Qualifying Interest with the potential to be affected via the identified pathway include:

- Blanket bogs (* if active bog) [7130]

##### 4.2.2.3.1 *Blanket bogs (* if active bog) [7130]*

Blanket bog has not been mapped in detail for Slieve Fyagh Bog SAC, but from current available data the total area of the qualifying habitat is approximately 1,700 ha and extensive areas of blanket bogs were recorded throughout this SAC (Foss and McGee (1987); Douglas et al. (1989)).

### 4.2.3 Glenamoy Bog Complex SAC [000500]

The relevant QIs and the associated conservation objectives of the site are presented in Table 4-9. The Targets and Attributes for the relevant habitats and species, as described in the SSCOs (NPWS 2017b) were reviewed and considered in this assessment.

#### 4.2.3.1 Review of Conservation Objectives

*Table 4-9 Qualifying Interests and Conservation Objective (Version 1, 2017b)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Natural dystrophic lakes and ponds [3160] | To maintian the favourable conservation condition of this habitat in Glenamoy Bog Complex SAC |
| Northern Atlantic wet heaths with *Erica tetralix* [4010] | To restore the favourable conservation condition of this habitat in Glenamoy Bog Complex SAC |
| *Juniperus communis* formations on heaths or calcareous grasslands [5130] | To maintian the favourable conservation condition of this habitat in Glenamoy Bog Complex SAC |
| Blanket bogs (*if active bog) [7130] | To restore the favourable conservation condition of this habitat in Glenamoy Bog Complex SAC |
| Transition mires and quaking bogs [7140] | |
| Drepressions on peat substrates of the *Rhynchosporion* [7150] | |
| *Saxifraga hirculus* (Marsh saxifrage) [1528] | To maintian the favourable conservation condition of this species in Glenamoy Bog Complex SAC |

### 4.2.3.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the proposed development. These are provided in Table 4-10. 'Roads, motorways' and 'forestry clearance' are loosely associated with the proposed development.

*Table 4-10 Site-specific threats, pressures and activities with potential to effect on the SAC*

| Negative Impacts | | | |
|---|---|---|---|
| **Rank** | **Threats and pressures [code]** | | **Inside/outside/both** |
| M | A02.01 | Agricultural intensification | i |
| H | A04.01.02 | Intensive sheep grazing | i |
| H | B01 | Forest planting on open ground | b |
| L | B02.02 | Forestry clearance | b |
| H | B05 | Use of fertilizers (forestry) | b |
| L | C01.01.02 | Removal of beach materials | i |
| H | C01.03.01 | Hand cutting of peat | i |
| H | C01.03.02 | Mechanical removal of peat | i |
| L | D01.02 | Roads, motorways | i |
| M | E03.01 | Discharges | b |
| L | G01 | Outdoor sports and leisure activities, recreational activities | i |
| L | G05.01 | Trampling, overuse | i |
| M | G05.09 | Fences, fencing | i |
| M | J02.12 | Dykes, embankments, artificial beaches, general | i |

Rank: H = high, M = medium, L = low; i = inside, b = both

## 4.2.3.3 Annex II Species of Glenamoy Bog Complex SAC

The Qualifying Interest with the potential to be affected via the identified pathway include:

- *Saxifraga hirculus* (Marsh saxifrage) [1528]

### 4.2.3.3.1 *Saxifraga hirculus (Marsh saxifrage) [1528]*

According to the SSCOs, the two known populations of marsh saxifrage in Glenamoy Bog Complex SAC occur at Barroosky and Aghoo and the locations are illustrated on Map 6 of the SSCOs (NPWS 2017b).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): Marsh saxifrage (*Saxifraga hirculus*) is an herbaceous perennial that is restricted to mineral flushes in blanket bog. Formerly more widespread, the midlands sites recorded in the 1800s have since been lost to drainage and peat extraction. Marsh saxifrage is a weak competitor, so appropriate grazing that keeps the habitat open is important for the conservation of the species, although overgrazing may adversely affect seed set. Marsh saxifrage requires a stable, moving water table close to the soil surface, so maintenance of a suitable hydrological regime is also key to its conservation. Marsh saxifrage is listed on the Flora (Protection) Order, 2015 (S.I. No. 356/2015), and the all-Ireland population of the species was assessed as Near Threatened, based on a decline in its area of occupancy and extent of occurrence between the two assessment periods 1930-1969 and 1987-1999. There is no evidence of any major pressures currently impacting this species nationally, and therefore the Overall Status is assessed as Favourable.

### 4.2.3.4 Annex I Habitats of Glenamoy Bog Complex SAC

The Qualifying Interests with the potential to be affected via the identified pathway include:

- Natural dystrophic lakes and ponds [3160] (Map 4 of the SSCOs)
- 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]

#### 4.2.3.4.1 *Natural dystrophic lakes and ponds [3160]*

The indicative habitat area within the SAC is illustrated on Map 4 of the SSCOs (NPWS 2017b). The blanket bog in Glenamoy Bog Complex SAC has very well-developed pool systems and some deep, open lakes. Lake habitat 3160 is likely to occur in all pools and lakes, including the largest, Lougherglass (38.9ha). Although there are more than 2,100 lake/pool polygons, not all pools are shown on Map 4. All lakes and pools are considered to be potential 3160. The habitat is of high conservation value in the SAC.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): This habitat is mainly found in small lakes and pools in a mosaic with Atlantic and upland blanket bog and wet heath. As for other ombrotrophic peatland habitats, the acid oligotrophic lake habitat is species poor botanically, but has relatively greater invertebrate species richness. Additionally, while individual pools or lakes may be species poor, amongsite variation means that the habitat displays higher species richness at landscape and regional scales. Many of the typical acid oligotrophic lake habitat species are strongly associated with and sometimes restricted to the habitat. The habitat also varies across its Irish range, with altitude, geology and distance from the sea being the most likely drivers of the variation. On-going damage to peatland results in hydrological changes in lakes and ponds with the habitat, as well as increased sedimentation, colour, turbidity, organic material and ammonia. Fertilisation of forests can contribute to enrichment of the habitat. The Overall Status of the habitat is Inadequate, unchanged since the 2013 assessment.

#### 4.2.3.4.2 *Northern Atlantic wet heaths with Erica tetralix [4010]*

Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Glenamoy Bog Complex SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 723ha, covering 6% of the SAC and is documented to occur on hillsides within the SAC (NPWS internal files).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): Wet heath is a highly variable peatland habitat that is intermediate in many regards between dry heath and blanket bog, generally occurring on gently sloping, poorly draining ground on shallow or intermediate peat depths (typically less than 50cm deep). Area losses have continued into the current reporting period due to new forestry, paths, tracks and land clearance. Overgrazing, burning, wind farm development and erosion continue to be issues for this habitat. Nitrogen deposition from agricultural activities that generate air pollution has recently been recognised as negatively impacting this habitat. Furthermore, climate change is acknowledged to be a potential future threat to wet heath, as it is expected to cause rises in temperature and decreases in precipitation. As a result, the Overall Status is assessed as Bad and deteriorating.

#### 4.2.3.4.3 *Juniperus communis formations on heaths or calcareous grasslands [5130]*

Juniperus communis formations on heath or calcareous grasslands has not been surveyed in detail in Glenamoy Bog Complex SAC and thus the total area of the qualifying habitat is unknown. Douglas et al. (1989) noted juniper as being fairly widespread throughout the blanket bog habitat [7130*], particularly at pool margins and on islands within pool lakes. It also occurs on the coastal fringe and grades into heath and grassland communities in places.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): Juniper formations are mostly associated with lowland dry calcareous and neutral grassland, exposed calcareous and siliceous rock, and dry siliceous and calcareous heath; however, formations can also occur on coastal dunes and at higher altitudes. Local pressures were noted at some juniper stands, including overgrazing, erosion and small areas of juniper scrub removal, but none of the impacts were considered to be significant or to impact on the long-term viability of the habitat at the national level. Short periods of disturbance may even be beneficial by promoting regeneration. The Overall Status is assessed as Favourable and the trend is stable.

#### 4.2.3.4.4 *Blanket bogs (* if active bog) [7130]*

Blanket bog has not been mapped in detail for Glenamoy Bog Complex SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 6,749ha, covering 52% of the SAC (NPWS internal files). Blanket bog habitat occupies the gentle undulating plain that dominates the central areas of this SAC. It also extends uphill to cover the slopes of Maumakeogh and Benmore in the eastern sector of the SAC, and northward, out toward the sea cliffs of the north-west Mayo coastline (NPWS internal files). Important peatland sites within the SAC include Glenamoy Bog, Rathavisteen Bog, Maumkeogh Bog and Glencalry Bog.

#### 4.2.3.4.5 *Transition mires and quaking bogs [7140]*

Transition mires and quaking bogs have not been mapped in detail for Glenamoy Bog Complex SAC and thus the total area of the qualifying habitat is unknown. The habitat is documented to occur in areas where bog vegetation and base-rich flushes merge, and also at the interface between large pools/lakes and adjacent bog (NPWS internal files). Examples of this habitat can be found at Glenamoy Bog, Rathavisteen Bog and Glencalry Bog (Foss and McGee, 1987; Douglas et al., 1989; R. Hodd, pers. comm.).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): This QI habitat is a physically unstable peat-forming community, typically occurring as swards or floating mats over saturated peat or open water. There is usually an abundant bryophyte layer. Vegetation ranges from extensive floating mats of small to medium sedges with *Sphagnum* on open water, to localised basic flushes over acid peat with base-tolerant *Sphagnum* and brown mosses. Aquatic and semi-aquatic vegetation is frequently present. Transition mires are generally mineral rich (but not necessarily calcium rich), with slightly basic to moderately acid pH. Transition mires may occupy a physically transitional zone between bog and fen vegetation (e.g. the lagg zone of a raised bog), or where groundwater seeps through deep peat (e.g. upland soligenous flushes). They can also represent a transitional stage between groundwater-fed fen and rainwater-fed bog, as peat accumulates and isolates the vegetation from groundwater. Transition mire vegetation may also be found in damaged habitats, such as flooded peat cuttings over calcareous substrate. This habitat is widespread but localised in Ireland. It has been recorded most frequently in blanket bog regions in the north and west, limestone regions in the northwest and midlands, and in inter-drumlin hollows and lakes in the border counties. There are a number of rare and protected species which occur in, or are confined to, transition mire habitats in Ireland, such as the Annex II moss species *Hamatocaulis vernicosus* (also listed on the Flora

(Protection) Order, FPO) and the FPO species bog orchid (*Hammarbya paludosa*) and slender cottongrass (*Eriophorum gracile*). The main pressures facing transition mires in Ireland are afforestation, water pollution, drainage and hydrological changes. Grazing/agricultural management is also prominent as an issue. The Overall Status is assessed as Bad, as in the last two reporting periods. The trend is assessed as stable.

#### 4.2.3.4.6 *Depressions on peat substrates of the Rhynchosporion [7150]*

Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for Glenamoy Bog Complex SAC and thus the total area of the qualifying habitat is unknown. This habitat is typically confined to relatively small areas but is best represented around pool margins and in wet hollows in the SAC (NPWS internal files). Examples of this habitat can be found at Glenamoy Bog (Douglas et al., 1989).

## 4.2.4 Bellacorick Bog Complex SAC [001922]

The relevant QIs and the associated conservation objectives of the site are presented in Table 4-11. The Targets and Attributes for the relevant habitats and species, as described in the SSCOs (NPWS 2017c) were reviewed and considered in this assessment.

### 4.2.4.1 Review of Conservation Objectives

*Table 4-11 Qualifying Interests and Conservation Objective (Version 1, 2017c)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Natural dystrophic lakes and ponds [3160] | To maintian the favourable conservation condition of this habitat in Bellacorick Bog Complex SAC |
| Northern Atlantic wet heaths with *Erica tetralix* [4010] | To restore the favourable conservation condition of this habitat in Bellacorick Bog Complex SAC |
| Blanket bogs (*if active bog) [7130] | |
| Drepressions on peat substrates of the *Rhynchosporion* [7150] | |
| Alkaline fens [7230] | |

### 4.2.4.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the proposed development. These are provided in Table 4-12. ‘Roads, motorways’ is loosely associated with the proposed development.

*Table 4-12 Site-specific threats, pressures and activities with potential to effect on the SAC*

| Negative Impacts | | | |
|---|---|---|---|
| Rank | Threats and pressures [code] | | Inside/outside/both |
| M | A04 | Grazing | b |
| H | B01 | Forest planting on open ground | o |
| L | B01 | Forest planting on open ground | i |

| | | | |
|---|---|---|---|
| L | C01.03.01 | Hand cutting of peat | i |
| H | C01.03.02 | Mechanical removal of peat | b |
| L | D01.02 | Roads, motorways | b |
| M | D02.01 | Electricity and phone lines | o |
| L | D05 | Improved access to site | o |
| L | E01.03 | Dispersed habituation | o |
| M | E02 | Industrial or commercial areas | o |
| L | F03.01 | Hunting | i |

Rank: H = high, M = medium, L = low; i = inside, b = both

### 4.2.4.3 Annex I Habitats of Glenamoy Bog Complex SAC

The Qualifying Interests with the potential to be affected via the identified pathway include:

- Natural dystrophic lakes and ponds [3160] (Map 4 of the SSCOs)
- 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]

#### 4.2.4.3.1 Natural dystrophic lakes and ponds [3160]

The indicative habitat area within the SAC is illustrated on Map 3 of the SSCOs (NPWS 2017c). Bellacorick Bog Complex SAC has some of the most extensive extant areas of lowland blanket bog pool systems. Habitat 3160 is likely to occur in all pools and lakes and all are mapped as potential 3160 (see Map 3). Although there are more than 5,700 lake/pool polygons, many pools are not mapped in the 1:5,000 OSi data (see Map 3). The habitat is of high conservation value in the SAC, owing to the area, extent and morphological diversity of pools.

#### 4.2.4.3.2 Northern Atlantic wet heaths with Erica tetralix [4010]

Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Bellacorick Bog Complex SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 187ha, covering 2% of the SAC (NPWS internal files). The habitat occurs occasionally on sloping ground and on elevated mounds of mineral soil that are scattered throughout the lowland blanket bog-covered plains. These are particularly evident in the Owenboy Nature Reserve and along some of the steeper stream valley sides (NPWS internal files).

#### 4.2.4.3.3 Blanket bogs (* if active bog) [7130]

Blanket bog has not been mapped in detail for Bellacorick Bog Complex SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 6,286ha, covering 66% of the SAC (NPWS internal files). The habitat is documented to occur throughout the SAC.

#### 4.2.4.3.4 Depressions on peat substrates of the Rhynchosporion [7150]

Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for Bellacorick Bog Complex SAC and thus the total area of the qualifying habitat in the SAC is unknown. The habitat occurs in locations supporting pools and wet quaking peat (NPWS internal files).

#### 4.2.4.3.5 *Alkaline fens [7230]*

Alkaline fens has not been mapped in detail for Bellacorick Bog Complex SAC and thus the total area of the qualifying habitat in the SAC is unknown. The habitat is documented to occur throughout the SAC, but is most well-developed along the eastern margin.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): Alkaline fens are groundwater-fed, generally peat-forming systems with extensive areas of species-rich small sedge and brown moss communities. They occur in areas where there is a high water table and a base-rich, often calcareous water supply. Alkaline fens can develop in areas where vertical water movement predominates (topogenous), such as poorly drained basins or hollows and open water transitions; or where horizontal water movement is also important (soligenous), such as flushes, valley fens and the laggs of raised bogs. However, this distinction is not always clear (such as in large floodplain fens which can include both elements). Fen systems are often a complex mosaic of habitats, with tall sedge beds, reedbeds, wet grasslands, springs and open water co-occurring. Alkaline fens are relatively widespread in Ireland. The most extensive areas of alkaline fens are thought to occur in lowland basins associated with limestone groundwater bodies (often in midland areas). Alkaline fens associated with flushes and open water transitions tend to be smaller, but may be more widespread than those in lowland basins. The main pressures facing the habitat in Ireland are land abandonment (and associated succession), overgrazing, drainage and pollution. The Overall Status is assessed as Bad with a deteriorating trend due to losses of area and habitat quality, as well as the pressures and threats faced by the habitat.

## 4.2.5 Owenduff/Nephin Complex SAC [000534]

The relevant QIs and the associated conservation objectives of the site are presented in Table 4-13. The Targets and Attributes for the relevant species, as described in the SSCOs (NPWS 2017d) were reviewed and considered in this assessment.

### 4.2.5.1 Review of Conservation Objectives

*Table 4-13 Qualifying Interests and Conservation Objective (Version 1, 2017d)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Natural dystrophic lakes and ponds [3160] | To maintain the favourable conservation condition of these habitats in Owenduff/Nephin Complex SAC |
| Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] | |
| Northern Atlantic wet heaths with *Erica tetralix* [000534] | To restore the favourable conservation condition of these habitats in Owenduff/Nephin Complex SAC |
| Alpine and Boreal heaths [4060] | |
| *Juniperus communis* formations on heaths or calcareous grasslands [5130] | To maintain the favourable conservation condition of this habitat in Owenduff/Nephin Complex SAC |
| Blanket bogs (* if active bog) [7130 | To restore the favourable conservation condition of these habitats in Owenduff/Nephin Complex SAC |
| Transition mires and quaking bogs [7140] | |
| *Salmo salar* (Salmon) [1106] | To restore the favourable conservation condition of this species in Owenduff/Nephin Complex SAC |
| *Lutra lutra* (Otter) [1355] | To maintain the favourable conservation condition of this species in Owenduff/Nephin Complex SAC |

### 4.2.5.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SPA were reviewed and considered in relation to the proposed development. These are provided in Table 4-14. 'Roads, motorways' is loosely associated with the proposed development.

*Table 4-14 Site-specific threats, pressures and activities with potential to effect on the SPA*

| Negative Impacts | | | |
|---|---|---|---|
| **Rank** | **Threats and pressures [code]** | | **Inside/outside/both** |
| H | A04 | Grazing | b |
| L | A08 | Fertilisation | i |
| H | B | Sylviculture, forestry | o |
| L | B | Sylviculture, forestry | i |
| M | C01.03 | Peat extraction | b |
| L | D01.02 | Roads, motorways | o |
| L | E01.03 | Dispersed habituation | o |
| L | F02.03 | Leisure fishing | b |
| L | F03.01 | Hunting | b |
| L | J01 | Fire and fire suppression | b |

*Rank: H = high, M = medium, L = low; i = inside, o = outside, b = both*

### 4.2.5.3 Annex II Species of Owenduff/Nephin Complex SAC

The Qualifying Interests with the potential to be affected via the identified pathways include:

- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

#### 4.2.5.3.1 Salmo salar *(Salmon) [1106]*

Salmon distribution within the SAC is not mapped.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): The Irish population generally comprises fish that spend usually two years as sub-adults in freshwater before going to sea as smolts. The majority of fish spend one winter at sea before returning to their natal rivers, mainly during the summer, as grilse. Smaller numbers spend two winters at sea, returning mainly in spring, hence "spring" salmon. A small proportion of the adult population returns to the sea post spawning and can return to spawn again. The survival of salmon during the marine phase of its lifecycle has been identified as the key determinant of trends in population size in natal rivers. Known pressures include exploitation at sea in commercial fisheries, interceptory fisheries in coastal waters, aquaculture and predation. In addition, the negative influence of climate change on food prey structure and abundance has increasingly been attributed to the declines observed in stocks at sea. Within river systems, variation in individual stock abundance can be influenced by a variety of factors, notably alterations in physical habitat, water quality, environmental factors, predation, and angling and commercial fisheries exploitation pressure. There is considered to be sufficient habitat in Ireland to support a viable salmon population. Freshwater quality in Ireland continues to remain a concern but ongoing pressures linked with habitat quality are not considered to be compromising the viability of the species. The Overall Status is assessed as Inadequate, the same as the last assessment. Although a short-term negative trend is reported for this species, the trend has reversed in the last 5 years.

#### 4.2.5.3.2 *Lutra lutra (Otter) [1355]*

The extent of terrestrial habitat has been mapped and calculated as 840.63ha along riverbanks/lake shoreline/around pools, the extent of freshwater (river) habitat has been mapped and calculated as 382.65km and the extent of freshwater (lake) habitat has been mapped and calculated as 540.66ha.

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): In general, this QI species has two basic requirements: aquatic prey and safe refuges where they can rest. In Ireland, otter populations are found along rivers, lakes and coasts, where fish and other prey are abundant, and where the bank-side habitat offers plenty of cover. The otter is an opportunistic predator with a broad and varied diet. In coastal areas fish, crabs and molluscs are known to be eaten. In freshwater areas a variety of fish from sticklebacks to salmon and eels will be taken, while crayfish and frogs can be important locally or seasonally. A total of 44 SACs have been designated for the otter comprising extensive stretches of river channels and coastline (including off-shore islands) as well as lakes and blanket bog systems. The main threats to the otter include pollution, particularly organic pollution resulting in fish kills; and accidental deaths (road traffic and fishing gear). Although recent studies on territory overlaps and animal movements suggest that refinements to the population estimation formula are needed, the otter population (estimated at between 7,000 and 10,000 breeding females) is considered to be increasing and none of the threats or pressures identified is considered likely to impact significantly on the species. The Overall Status of otter is therefore considered to be Favourable, unchanged since the previous reporting period.

### 4.2.5.4 Annex I Habitats of Owenduff/Nephin Complex SAC

The Qualifying Interests with the potential to be affected via the identified pathway include:

- Natural dystrophic lakes and ponds [3160] (Map 3 of the SSCOs)
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- Alpine and boreal heaths [4060]
- *Juniperus communis* formations on heaths or calcareous grasslands [5130]
- Blanket bogs (* if active bog) [7130]
- Transition mires and quaking bogs [7140]

#### 4.2.5.4.1 Natural dystrophic lakes and ponds [3160]

The indicative habitat area within the SAC is illustrated on Map 3 of the SSCOs (NPWS 2017d). Owenduff/Nephin Complex SAC has both lowland blanket bog pool systems and upland lakes with habitat 3160. The habitat is likely to be found in many lakes in the SAC, where it may co-occur with lake habitat 3110, and all lakes, with the exception of Lough Feeagh, have been mapped as potential 3160 (see Map 3). Many of the bog pools are not mapped in the 1:5,000 OSi data (map 3). Lake habitat 3160 is of high conservation value in the SAC. As noted above, all lakes and ponds in the SAC, with the exception of Lough Feeagh, have been mapped as potential 3160 (see Map 3). Atlantic blanket bog pools, including interconnecting pool systems, were recorded at Uggool, Sheeanmore and Altnabrocky, Owenglass West and East, Bellagaravaun, and other areas of the SAC (Foss and McGee, 1987; Douglas et al., 1989).

#### 4.2.5.4.2 Watercourses of plain to montane levels with Ranunculion fluitans and Callitricho-Batrachion vegetation [3260]

The description of habitat 3260 covers from upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. Owenduff/Nephin Complex SAC was selected for highly oligotrophic, base-poor rivers, with limited aquatic vegetation. The main rivers in the SAC are the Owenduff and its tributaries to the south, and parts of the Owenmore and tributaries to the northeast. The Owenduff system was rated as of unique conservation importance and had communities dominated by mosses, liverworts and algae (Heuff, 1987). It is likely that most streams and rivers in the SAC have been negatively impacted by overgrazing in the Nephins and Nephin Begs (see NPWS, 2006; Murray et al., 2013).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): This habitat has a broad definition, covering upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the riverine areas of highest conservation interest are associated with lowland depositing and tidal rivers and unmodified, fast-flowing, lownutrient rivers. A number of rare submerged and marginal species are found in the former including opposite-leaved pondweed (*Groenlandia densa*), water-starworts (e.g. *Callitriche truncata*), triangular club-rush (*Schoenoplectus triqueter*), needle spike-rush (*Eleocharis acicularis*) and mud-dwelling mosses (e.g. *Ephemerum* spp.). The low-nutrient, high-velocity river types are associated with high bryophyte diversity, cascades, riffles and riparian woodland. Important communities also occur in groundwater-fed, base-rich oligotrophic rivers. Many Irish rivers have been heavily modified, particularly through arterial drainage and channelisation. These activities have changed channel hydrology and morphology, resulting in the accumulation of larger amounts of fine sediment. Such fines provide a rooting medium for plants and, as a result, stream watercrowfoot (*Ranunculus penicillatus*) has increased in abundance. Consequently, the habitat erroneously became synonymous with water-crowfoot in Ireland. Crowfoot dominated reaches frequently have low diversity and are of low conservation value, and an abundance of the species generally indicates poor condition and damage. The main problems for river habitats in Ireland are damage through hydrological and morphological change, eutrophication and other water pollution. The EPA continues to highlight the decline in high quality rivers. While not all variants of the river habitat require low nutrient conditions, this trend is a significant concern. Agriculture and municipal and industrial discharges are the most significant sources of nutrient and organic pollution. The Overall Status of the habitat is Inadequate and deteriorating, unchanged since the 2013 assessment.

#### 4.2.5.4.3 Northern Atlantic wet heaths with Erica tetralix [4010]

Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Owenduff/Nephin Complex SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 4,524ha, covering 17% of the SAC (NPWS internal files). The habitat is documented to occur in mosaic with blanket bog within the SAC and is present on the lower slopes of mountains (NPWS, 2006).

#### 4.2.5.4.4 Alpine and Boreal heaths [4060]

Alpine and Boreal heaths have not been mapped in detail for Owenduff/Nephin Complex SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 1,150ha, covering 4% of the SAC (NPWS internal files). The habitat occurs on summits and ridges above 400-500m where it forms a mosaic with bare rock (NPWS internal files).

From 'The Status of EU Protected Habitats and Species in Ireland (NPWS 2019): Alpine and Boreal heath consists of two distinct subtypes in Ireland. The upland subtype occurs on the exposed summits and upper slopes of mountains on acidic substrate. It typically occurs from around 350-400m upwards, but can occur at lower altitudes in more exposed locations. The vegetation is characterised by lowgrowing, wind-clipped dwarf shrubs, with ling (*Calluna vulgaris*) typically the most frequent, and by the abundance of the moss *Racomitrium lanuginosum*. While the presence of arctic-alpine species indicates high quality examples of this variant, it is not deemed a requisite. The lowland subtype comprises Dryas heath on limestone. The vegetation is characterised by mats of mountain avens (*Dryas octopetala*) accompanied by species typical of calcareous grassland. Sheep grazing is widespread in uplands where this habitat occurs and is a problem for the habitat where grazing levels are high. Hill walking is often concentrated on the summits and ridges where this habitat is found, and can cause erosion and damage to the habitat. Agricultural activities that cause air pollution and consequently nitrogen deposition are also considered to cause significant impacts. Climate change is recognised as a potential future threat to the habitat in the future, particularly in the context of rising temperatures and decreases in precipitation. Considering these on-going pressures and threats, the Overall Status is assessed as Bad, unchanged since the 2013 assessment. The improving trend is based on the assumption that the reduced grazing brought about by the Commonage Framework Plans continues to have a positive effect on this habitat.

#### 4.2.5.4.5 Juniperus communis formations on heaths or calcareous grasslands [5130]

*Juniperus communis* formations on heaths or calcareous grasslands habitat has not been mapped in detail for Owenduff/Nephin Complex SAC and thus the total area of the qualifying habitat is unknown. It has been noted that the habitat is rare within the SAC (Foss and McGee, 1987; Douglas et al., 1989) and is largely confined to ungrazed islands within larger dystrophic and oligotrophic lakes, and may also occur near well-drained areas of bog surrounding rock outcrops in the SAC, and often occurs in a mosaic with wet heath (NPWS, 2006; NPWS internal files)

#### 4.2.5.4.6 Blanket bogs (* if active bog) [7130]

Blanket bog has not been mapped in detail for Owenduff/Nephin Complex SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 18,393ha, covering 68% of the SAC (NPWS internal files). The habitat covers most of the western and northern parts of the SAC, as well as much of the upland areas in the east and south. Large areas of intact blanket bog are also present in the centre of the SAC.

#### 4.2.5.4.7 *Transition mires and quaking bogs [7140]*

Transition mires and quaking bogs have not been mapped in detail for Owenduff/Nephin Complex SAC and thus the total area of the qualifying habitat is unknown. The habitat occurs in locations where bog vegetation merges with base-rich flushes, and at the interface between water bodies and adjacent bog. Examples can be found at Owenglass West, Uggool, Sheeanmore and Lagduff.

## 4.2.6 Owenduff/Nephin Complex SPA [004098]

The relevant SCIs and the associated conservation objectives of the site are presented in Table 4-15. No detailed Conservation Objectives are available for Owenduff/Nephin Complex SPA or any other SPA which has the same SCIs. In the absence of SSCOs, the attributes and targets for breeding species of the River Shannon and River Fergus Estuaries SPA (NPWS 2012) were reviewed and considered in this assessment.

### 4.2.6.1 Review of Conservation Objectives

*Table 4-15 Special Conservation Interests and Conservation Objective (Version 8.0, 2021)*

| Qualifying Interest | Conservation Objective |
|---|---|
| Merlin (*Falco columbarius*) [A098] | This site has the generic Conservation Objective:<br><br>'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests of this SPA' |
| Golden plover (*Pluvialis apricaria*) [A140] | |

### 4.2.6.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SPA were reviewed and considered in relation to the proposed development. These are provided in Table 4-16. 'Roads, motorways' is loosely associated with the proposed development.

*Table 4-16 Site-specific threats, pressures and activities with potential to effect on the SPA*

| Negative Impacts | | | |
|---|---|---|---|
| **Rank** | **Threats and pressures [code]** | | **Inside/outside/both** |
| H | A04 | Grazing | b |
| L | A08 | Fertilisation | i |
| H | B | Sylviculture, forestry | o |
| M | B | Sylviculture, forestry | i |
| M | C01.03 | Peat extraction | b |
| L | D01.02 | Roads, motorways | o |
| L | E01.03 | Dispersed habituation | o |
| L | F02.03 | Leisure fishing | b |
| L | F03.01 | Hunting | b |
| L | J01 | Fire and fire suppression | b |

*Rank: H = high, M = medium, L = low; i = inside, o = outside, b = both*

### 4.2.6.3 Annex I Species of Owenduff/Nephin Complex SPA

The Special Conservation Interests with the potential to be affected via the identified pathway include:

- Merlin (*Falco columbarius*) [A098]
- Golden Plover (*Pluvialis apricaria*) [A140]

No detailed Conservation Objectives are available for this SPA. Data for the species was taken from the site synopsis of this site (NPWS 2015) and species information was obtained from Birdwatch Ireland (https://birdwatchireland.ie).

#### 4.2.6.3.1 *Falco columbarius (Merlin) [A098]*

Merlin nests within the SPA (population conservatively estimated at between 4 and 8 pairs). This small falcon has a preference for heather bog areas, particularly marginal zones between blanket bog and heath/upland grassland. The Merlins hunt small birds, especially Meadow Pipits.

From Birdwatch Ireland (birdwatchireland.ie): In general, Merlin is a rare breeding bird in Ireland. It nests on the ground on moorland, mountain and blanket bog and in woodland and has taken to nesting in forestry plantations adjacent to moorland. More Merlins are found in the west of the country but they are scattered across the midlands and the Wicklow Mountains also hold good numbers. It is a local summer visitor to uplands throughout Ireland and a widespread winter visitor at lowland sites from October to April. Merlins move away from high ground at this time of the year and can often be seen on the coast, where concentrations of other birds are attractive as prey species. The Irish breeding population of Merlin is currently amber listed (BoCCI, 2021).

#### 4.2.6.3.2 *Pluvialis apricaria (Golden Plover) [A140]*

A nationally important population of Golden Plover breeds within the SPA (15 pairs in 2004).

From Birdwatch Ireland (birdwatchireland.ie): Golden Plover is a summer visitor from France & Iberia (though possibly some remain year-round in Ireland) and a winter visitor from Iceland. In general, the Irish breeding distribution of Golden Plover is limited to the uplands of northwest counties in Ireland where it breeds in heather moors, blanket bogs & acidic grasslands. The wintering population is widespread throughout Ireland where the species can be found in densely-packed flocks, and in a variety of habitats, both coastal and inland. The species feeds on a variety of soil and surface-living invertebrates, principally beetles and earthworms, but also on plant material such as berries, seeds and grasses. They regularly feed in association with Lapwing & Black-headed Gulls. The Irish breeding and wintering populations of Golden Plover are currently red listed (BoCCI, 2021).

## 4.2.7 Baseline Hydrology

The baseline hydrology of the site and surrounding area has been fully assessed and this assessment is provided in full in Appendix 3 to this NIS. The relevant Sections of the hydrological assessment, which describe the baseline hydrological environment, are provided below:

> *'The Proposed Development site is within a headwater catchment of the Owenmore River which drains to Tullaghan Bay (Figure 9-2). The Owenmore River catchment encompasses a total area of approximately 240 km$^2$, incorporating streams draining north from the Nephin Beg range, streams draining south through the Oweninny River catchment, and the drainage out of Carrowmore Lough, via Munkin River'.*

A regional hydrology map is attached as **Figure 9.2**, Chapter 9 of the EIAR, provided in Appendix 3 of this NIS.

*Both Sheskin River and the unnamed stream originate at higher elevation within Sheskin Forest, being fed by runoff and a series of bog seeps/springs. Several small tributaries merge progressively as they flow eastward. The seeps and springs at higher elevation appear as 'rises' on the 6-inch sheets from OSI which show the original, natural drainage pattern of the site in the mid-19th Century.*
*The Sheskin River and unnamed stream merge on lower ground to the east of the Proposed Development site. From their point of merger, the streams flow combined as the Sheskin River before merging with the Oweninny River in the townland of Shranakilly. South of this confluence point, the Oweninny River becomes the Owenmore River.*

*The Owenmore River flows south and turns sharply to the west at Bellacorick (by the N59), from where it subsequently flows west through Bangor Erris and discharges directly to sea in Tullaghan Bay. The straight-line distance of flow from Sheskin River via Owenmore River to sea is approximately 30 km. The grid connection route of the Proposed Development also crosses the subcatchment of a second unnamed stream which drains south from the southern boundary of Sheskin forest. The unnamed second stream merges directly with Owenmore River in the townland of Tawnaghmore.*

Section 9.33, Chapter 9 of the EIAR (see Appendix 3) provides details of the local and regional hydrology in relation to all elements of the proposed development, grid connection, amenity area and car park

## 4.3 Ecological Survey Results

The majority of habitats within the EIAR Site Boundary 964 hectares/81% is dominated by plantation forestry (including clear fells), comprising mainly of Lodgepole pine (*Pinus contorta*) with some Sitka spruce (*Picea sitchenis*) planted on Lowland Blanket Bog (PB3). Remnants of this habitat are still found on the site in degraded form. The site is accessible via the Western Way and a network of existing forestry access tracks and forestry rides.

Waterbodies within the Proposed Development site including drainage ditches and small streams classified as upland eroding rivers provide hydrological connectivity with downstream designated sites and are further described in this section. Watercourses within the Site Boundary are mapped on Figure 3-1 of the Screening for Appropriate Assessment, indicating hydrological connectivity with downstream EU Sites.

**Conifer plantation (WD4) and Recently-felled woodland (WS5)**

In total, approximately 964 hectares/81% of the site comprises of coniferous plantation forestry (Plate 4-1 and Plate 4-2). This includes forestry (WD4) of various ages (including clear-felled areas, semi-mature and mature stands, along with immature pre-thicket areas of both first and second rotation. Lodgepole pine (*Pinus contorta*) is the dominant species with Sitka spruce (*Picea sitchensis*) only occurring in pockets of the site. Mature conifer plantation is interspersed with immature stands. The understorey is typically species-poor in forestry plantations and covered with needles. Vegetation is usually restricted to a few bryophytes and ferns which include hard fern (*Blechnum spicant*), bracken (*Pteridium aquilinum*), *Sphagnum* spp. and *Thuidium tamariscum* (Plate 4-3). Occasionally, lesser twayblade (*Listera cordata*) was found growing within the plantation.

As the forestry was originally planted on peatland habitats, forestry rides or small clearings within the forestry trees failed to grow can be dominated by purple moor-grass (*Molinia caerulea*), ling heather (*Calluna vulgaris*) and *Sphagnum* spp. These areas are usually small and only make up a fraction of the overall forestry plantation – however, a cluster of them can be found in the north, west and south-west of the site which frequently contain bog pools or soaks (Plate 4-4, 4-5). Areas with a large clusters of bog pools and soaks or large single bog pools are overlain on the habitat map and referred to as 'bog pools'.

One relevé (see Relevé 1 data, Appendix 6-1of the EIAR) was taken in one of the large 'bog pool' areas in the north of the site (Plate 4-6). Dominant species included purple moor grass, ling heather, *C. portentosa, R. lanuginosum S. cuspidatum* and *S. capillifolium* but common cottongrass (*Eriophorum angustifolium*), tormentil and round-leaved sundew (*Drosera rotundifolia*) were also present; the ground was wet and frequently quaking.

Forestry largely failed to grow in the north-west corner of the site resulting in extremely patchy tree cover. Where aerial photography indicates the presence of planting ridges, habitat has been classified as conifer plantation, the vegetation in open areas between trees is very similar to that of the surrounding blanket bog, which is described in more detail below.

All of the proposed wind farm infrastructure is located within conifer plantation (WD4) or recently-felled woodland (WS5) habitat (Figure 4-7). None of the Proposed Development is located within significant open areas classified as conifer plantation but with remnant peatland vegetation (e.g. those indicated as 'bog pools').

*Plate 4-1: Example of Conifer plantation (WD4) in the north-east of the site where Lodgepole pine is interplanted with Sitka spruce.*

*Plate 4-2: Example of recently felled (WS5) and replanted (WD4, background) Conifer plantation within the site boundary.*

*Plate 4-3: Typical ground cover inside a semi-mature lodgepole pine plantation area*

*Plate 4-4: Open area where forestry failed to grow due to wet ground conditions, indicated by Sphagnum covered soaks and small pools in the north of the site*

*Plate 4-5: Large bog pool within the conifer plantation in the south of the site*

**Lowland Blanket Bog (PB3)**

The Proposed Development site is surrounded by Lowland Blanket Bog (PB3) to the north, west and south. Within the site, this habitat is confined to the north-western corner of the site, and another small area is found on sloping ground between a watercourse and one of the existing roads.

The area in the north-west is connected to extensive peatlands of the Slieve Fyagh Bog SAC and bordered by straggling forestry plantation. While this contains many open areas with vegetation similar to that described below, only areas that were free of planting ridges are shown as Lowland Blanket Bog in Figures 6-6 and 6-7 of the EIAR accompanying this application.

Vegetation is dominated by ling heather, purple moor grass, deer grass (*Trichophorum cespositum*), *Cladonia portentosa* and *unicalis, Racomitrium lanuginosum* and *Sphagnum capillifolium* and *S. papillosum* (Plate 4-6; for details on vegetation see Relevé 2 data, Appendix 6-1 of the EIAR). Bog pools and soaks were occasionally present. The habitat was classified as *Erica tetralix – Molinia caerulea – Cladonia portentosa* Bog/Heath' using the Irish Vegetation Classification (IVC) following analysis with ERICA[3]. This is predominantly a community of lower mountain slopes and boglands, occasionally higher up (mean altitude = 219 m), occurring on wet, acidic and infertile peats. It may form part of blanket bog or wet heath vegetation. Due to the depth of the peat (>1m), this habitat was categorised as Lowland Blanket Bog (PB3). Signs of degradation are evident in the form of encroachment of conifers as well as patches of bare and eroding ground, but this habitat nevertheless qualifies as Annex I Blanket bog [7130].

The Proposed Development footprint is located well outside this area. Peatland restoration (e.g. conifer removal, re-wetting) is proposed in this area (see Appendix 6-5 of the EIAR).

[3] *Engine for Relevés to Irish Communities Assignment (ERICA)*

*Plate 4-6: Lowland Blanket Bog (PB3) in the north-west of the site.*

The vegetation alongside the existing road within the site (Plate 4-7) was dominated by purple moor grass, ling heather and *Hylocomium splendens* and ground conditions were dry (for details on vegetation see Relevé 2 data, Appendix 6-1 of the EIAR). It was classified as '*Calluna vulgaris – Molinia caerulea – Erica cinerea* Heath' using the IVC. This is described as a community of the lower to middle slopes of hills and mountains (mean altitude = 227 m), primarily wet heathland where soils are rather poorly drained, acidic and infertile. As the peat depths in this area were well in excess of 50cm, the habitat was categorised as degraded Lowland Blanket Bog (PB3) with low *Sphagnum* cover (< 20%). This habitat qualifies as Annex I Blanket bog [7130].

None of this habitat will be lost to the development, however, upgrades are proposed to the existing road adjacent to the area described above.

*Plate 4-7: Lowland Blanket Bog (PB3) adjacent to an existing road where upgrades are proposed.*

**Dystrophic lakes (FL1)**

Three Dystrophic lakes (FL1) can be found in the south-west of the site. Vegetation in and on the margins of the lakes and ponds included bog bean, *Sphagnum cuspidatum*, bulbous rush (*Juncus bulbosus*), lesser bladderwort (*Utricularia minor*) and alternate leaved milfoil (*Myriophyllum alterniflorum*). Margins of the lakes and ponds were usually quaking and they were surrounded by open areas with peatland vegetation. Due to the presence of planting ridges in these areas, they are classified as conifer plantation (WD4).

None of this habitat will be lost to the development.

**Spoil and bare ground (ED2)**

Unbound forestry tracks throughout the site were categorised as Spoil and bare ground (ED2) (Plate 4-8). The verges across much of the site contained small areas of scrub (WS1) as well as species typical of wet grassland (GS4) or surrounding peatland habitats (PB3) which were not mapped due to their small size and mosaic-like occurrence. Species recorded comprised purple moor grass, ling heather. sweet vernal grass (*Anthoxanthum odoratum*), soft rush, self heal (*Prunella vulgaris*), rough hawksbit (*Leontodon hispidus*), *Carex* ssp, bracken, hard fern, common butterwort (*Pinguicula vulgaris*), ribwort plantain (*Plantago lanceolata*) and *P. commune*.

Upgrading of existing forestry tracks is proposed across the site, as shown in Figure 6-7 of the EIAR accompanying this application.

*Plate 4-8: Example of existing unbound forestry tracks categorised as Spoil and bare ground (ED2)*

**Eroding/upland rivers (FW1)**

The Sheskin stream and a number of unnamed watercourses drain the windfarm site, nearly all of which flow in an easterly direction into the Owenmore River. The Glencullin stream flows in the opposite direction towards Carrowmore Lough in the south-western corner of the site but no infrastructure is proposed in the vicinity of this stream. The streams within the windfarm site were generally small, up to a metre wide, fast flowing and shallow with a rocky substrate (Plate 4-9). Some of them, including the Sheskin stream were completely overgrown with rushes and grassy vegetation, at least in parts (Plate 4-10). Most of the streams were surrounded by forestry and did not contain submerged vegetation, however, water-starwort (*Callitriche stagnalis*) and bog pondweed (*Potamogeton polygonifolius*) was found occasionally growing in the water where forestry cover was absent.

Where they were not located within conifer plantation, watercourses were bordered by scrub (WS1) or vegetation typical of wet grassland (GS4) or surrounding peatland habitats such as ling heather, soft rush, daisy (*Bellis perennis*), Yorkshire fog, *P. commune* and occasional yellow iris (*Iris pseudacoris*) or bracken. Due to their small size and patchy occurrence, these habitats were not mapped.

*Plate 4-9: Unnamed stream flowing through the approximate centre of the site.*

*Plate 4-10: The Sheskin stream in the vicinity of T8 in the north-west of the site*

**Drainage ditches (FW4)**

Drainage ditches are frequently present along the existing road (Plate 4-11) and within the forestry. Some carry water while others were dry at the time of visit and are frequently overgrown or filled with *Sphagnum.* These ditches form part of the drainage system for the site and ultimately connect with the Owenmore River. This habitat was not mapped as it was ubiquitous throughout the site and largely associated with and covered by forestry.

*Plate 4-11: Sphagnum filled drain alongside the existing road*

### 4.3.1.1 Habitats on the Grid Connection and Site Access Routes

The proposed grid connection route has an approximate length of 6.9 km. It will leave the on-site substation and travel south, following existing forestry tracks (ED2) to the east of the conifer plantation (WD4). Vegetation alongside the track consists largely of soft rush, purple moorgrass, knapweed (*Centaurea* nigra) and gorse (*Ulex europaeus*) and bramble (*Rubus fruticosus*) scrub (WS1). A small area of blanket bog (PB3) is found opposite of the substation. This is in poor condition adjacent to the road due to disturbed ground and turf cutting but qualifies as Annex I Blanket bog [7130] approximately 15m past the verge. *Sphagnum* cover is > 50% and the vegetation comprises, amongst others, of purple moor grass, black bog rush (*Schoenus nigricans*), ling heather, bog asphodel, *R. lanuginosum* and bog myrtle (*Myrica gale*). Small bog pools with *S. cuspidatum* are found in this area as well. There will be no loss of this Annex I habitat as the cable will be laid into the existing track (ED2).

After leaving the conifer plantation (WD4), habitats adjacent to the existing road (BL3; Plate 4-12) include cutover bog (PB4) in early stages of revegetation dominated by swards of *E. angustifolium*, lowland blanket bog (PB3) in different stages of degradation, agricultural grassland (GA1) and areas of soft rush-dominated vegetation (GS4) on former blanket bog. After approximately 3km, the track meets the N59 national road categorised as buildings and artificial surfaces (BL3) which if follows for another 3.5km until the Bellacorrick substation (BL3). Vegetation either side can be classified as degraded lowland blanket bog (PB3), wet grassland (GS4), scrub (WS1) or agricultural grassland (GA1) and the Owenmore River (FW1) is flowing to the south of the road. None of the adjacent habitats will be lost to the Proposed Development as the cable will be laid into the existing track/road.

Several watercourses (FW1) draining from the grid connection route are crossed. These are flowing through concrete pipe or box culverts (Plate 4-13). There will be a total of 9 culvert and 3 bridge crossings along the underground cable. Two of the bridge crossings will require Horizontal Directional Drilling (see Section 9 of Appendix 4-5 and Figure 4-34 of Chapter 4 of the EIAR for detail) due to the insufficient deck cover within the bridge, while sufficient clearance exists within the third bridge structure and therefore the bridge can be crossed utilising the ducts in a flat formation method in the bridge deck. The locations of the bridges and culverts are shown on the site layout drawings included in Appendix 4-1 of the EIAR. The schedule of culvert crossing methodologies is shown in Appendix A of Appendix 4-5 of the EIAR. The proposed culvert crossing methods are shown in Figure 4-36, Chapter 4 of the EIAR.

The site access route is the same as the grid connection route but continues further north along the east of the site. Habitats that are located adjacent to the road are generally those described above but also include recently-felled woodland (WS5) and a small area of (mixed) broadleaved woodland (WD1) consisting of oak, sycamore, alder, willow and Scots pine that is located on private land and is infested with Rhododendron, as is much of the track verge. It is proposed to construct clear-span crossings watercourse crossings along the wind farm access roads at 4 no. locations using a bottomless box culvert. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 of the EIAR.  The clearspan watercourse crossing methodologies presented below will ensure that no instream works are necessary.

*Plate 4-12: Existing road (BL3) into which the cable is going to be laid*

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*Plate 4-13 Example of an existing concrete box culvert crossing along the proposed access route*

### 4.3.1.2 Habitats at the site of the Met Mast

The proposed met mast is located within the EIAR Site Boundary within Conifer plantation forestry (WD4) south of T5. The area is dominated by lodgepole pine mixed with small open areas of purple moor grass and ling heather (Plate 4-14) and is of low ecological significance.

*Plate 4-14 Habitat around the met mast*

### 4.3.1.3 Habitats recorded within road widening areas

In order to accommodate the delivery of turbine components and other abnormal loads between the N59 and the main site entrance, road widening works will be required along the L52926 local road in the townlands of Sheskin and Tawghnamore. The road widening works will extend slightly into the grassland habitat adjacent to the east side of the L52926 local road. Species recorded in this location include soft rush, purple moorgrass and bramble

Road widening works are also required at the junction between the N17 and N5 National Primary Roads in the townland of Ballyglass East, Co. Mayo. The location and extent of these widening works are shown in Figure 4-24 and Drawing No. 348276-110A1.1 in Appendix 14-1 of EIAR accompanying this application. Habitats recorded here included Dry meadows and grassy verges (GS2) with Scrub (WS1) dominated by Willow, bramble and Gorse. See Plate 4-16.

*Plate 4-15. Bramble scrub and grassland habitat located within area of proposed road widening works at the junction between the N59 and the main site entrance.*


*Plate 4-16. GS2 and WS! Recorded at proposed road widening area at the N5 and N17 junction*

## 4.3.2 Invasive species

During field surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted. *Rhododendron ponticum* was recorded from various areas within the site particularly along the access road beyond the main site entrance in the south eastern corner and along the road and adjacent watercourse leading to Turbine 21. Given the extent of the species within the site, best practice invasive species management measures have been incorporated into the proposed development, see Section 6.7.3.3 of the EIAR. The implementation of these measures will ensure that there is no potential for the spread of the species.

No additional species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 were recorded during the survey.

## 4.3.3 Fauna in the Existing Environment

Dedicated faunal walkover surveys were undertaken at the site on the following dates:

- 4th August 2021
- 10th August 2021
- 18th August 2021
- 2nd September 2021
- 24th September 2021
- 18th January 2022
- 21st January 2022

In addition to the above targeted surveys, additional faunal signs/sightings were also recorded during other surveys including habitat assessments, bat surveys and bird surveys. The site was also visited on numerous additional occasions during the undertaking of bat surveys throughout 2021.

The walkover survey was designed to detect the presence, or likely presence, of a range of protected species, including bats, otter and badger. Potential suitable habitats were investigated for signs of animal presence. The following subsections provide a breakdown of the species recorded within the Proposed Development boundary during the site visit and assessment.

### 4.3.3.1 Otter

Potential otter trails (depressed grass) were recorded along several of the watercourses, however, no spraints, slides or other signs were recorded within the site boundary despite dedicated surveys. Habitat suitability for otter within the EIAR Site Boundary was typically poor given the small, high-energy, upland nature of most watercourses surveyed but otter has been recorded from downstream locations along the Oweniny and Owenmore Rivers (NPWS, NBDC).

### 4.3.3.2 Birds

The baseline ornithological interest of the Proposed Development site and surrounding area has been fully described in the baseline survey reports. in appendix 7-1 of the EIAR accompanying this application. A brief summary of the pre-existing survey data ornithological surveys for the Proposed Development conducted between October 2019 and September 2022, inclusive is shown in Table 4-17. The results are only shown for SCI species for the SPAs considered in this NIS.

*Table 4-17. Summary of baseline for SCI species recorded during field surveys*

| SCI species | Baseline |
|---|---|
| **Merlin**<br>Special Conservation Interest (SCI) of Owenduff/Nephin Complex SPA [004098] | Current survey data<br>- Merlin was recorded on two occasions during VP surveys in October 2019. On both occasions, an adult male was observed in flight. One of these flights occurred inside the flight activity survey area. An adult male was also observed from VP6 flying south-westerly and low to the ground in clearfell and 2nd rotation forestry within the flight activity survey area in May 2020.<br>- In October 2020, an adult female was observed from VP1 on two separate occasions. In both instances, the bird was seen hunting low over bogland outside the 500 m flight activity survey area.<br>- An adult female was observed outside the flight activity area perched in a small tree northeast of VP1 in November 2021.<br>- There were no sightings of merlin during the 2021 or 2022 breeding season VP surveys.<br>- In late November 2019, there was an incidental sighting of an adult male sitting in vegetation whilst the surveyor travelled to VP2. |
| **Golden Plover**<br>Special Conservation Interest (SCI) of Owenduff/Nephin Complex SPA [004098] | - In late October 2019, a flock of 30 golden plover was observed in-flight northeast of VP4 (outside the flight activity survey area). This flock circled low over grassland moorland before landing on the ground. The same group was observed again during the same VP watch sitting east of the VP location.<br>- There were no observations of golden plover in flight during the breeding season 2020 or winter 2020/21 VP survey periods.<br>- Golden plovers were heard calling on a number of occasions during the 2021 breeding season (see Incidental Observations below); however, no observations were made, or flight paths recorded.<br>- During the 2022 moorland breeding bird survey, an estimated two pairs of golden plover were identified within the survey area (which encompassed the area from the site boundary extending out to a 1 km distance). At least one of these pairs was confirmed to have successfully bred as a pair with two chicks was recorded on the 14th July 2022. The closest of these pairs were located 590 m and 920 m from the nearest turbines.<br>- On 27th November 2019 a golden plover was heard calling from VP2. On 24th April 2020, a golden plover was heard calling high over VP3. No observations were made and no flight paths were recorded.<br>- During a hen harrier winter roost-watch at Lough Dahybaun on the 22nd February 2021, golden plover were heard in-flight moving across the lake but were not seen.<br>- Golden plovers were heard calling on four separate occasions during VP watches in the 2021 breeding season. Birds were heard calling from areas of bog and/or scrub from VP2 and VP3 during May and June 2021. In mid-May, golden plover was heard calling west of VP2 on more than one occasion. In late June, golden plover was heard calling in bog and scrub habitat west and south of VP3.<br>- There were no additional observations of golden plover recorded during the 3-year survey period October 2019 to September 2022 inclusive. |

# 5. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

This Natura Impact Statement presents the data and information on the Proposed Development and provides an analysis comprising the scientific examinations of the Proposed Development and its implications for the European sites referred to above in view of their conservation objectives, and provides an analysis of whether the Proposed Development, in light of best scientific information, individually or in combination with other plans or projects, would adversely affect the integrity of a European Site. The NIS contains information which the competent authority, may consider in making its own complete, precise and definitive findings and conclusions and upon which it is capable of determining that all reasonable scientific doubt has been removed as to the effects of the Proposed Development on the integrity of the relevant Natura 2000 sites. Potential adverse effects are assessed in view of best scientific knowledge, based on objective information in relation to the Proposed Development including the proposed avoidance, reduction and preventive measures.

The following sections provide a review of the potential impact pathways for each of the EU Designated Sites identified for which potential pathway for effects have been identified (see Section 5). Mitigation measures for the avoidance of impact are then provided, followed by an assessment of potential effects, post implementation of the mitigation measures.

Taking a precautionary approach, the proposed works have the potential to cause of habitat degradation during the construction, operational and decommissioning phases, e.g. drainage or hydrological change (on several European sites- listed in section 2 and section 5.1 below) in the absence of mitigation.

Taking a precautionary approach, the proposed works have the potential to cause deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways (the latter where the proposed Grid Connection route crossings watercourses) during the construction, operational and decommissioning phase of the Proposed Development in the absence of mitigation.

Potential for ex-situ disturbance, displacement, barrier effects, mortality via collision with operational turbines and inadvertent destruction of nests have been considered in Sections 6.1.5 - 6.1.9 for the SCI bird species associated with Owenduff/Nephin Complex SPA that have been screened in for detailed assessment (see Section 5.1 and summarised in Table 5 1).

# 5.1 Impact Assessment

## 5.1.1 Potential Impacts on SCI Birds

### 5.1.1.1 Disturbance and Displacement

The sections below provide an analysis of potential disturbance and displacement impacts during construction and operational phases of the Proposed Development (see Section 4.2 of the Bird Impact Assessment Report). Section 5.3.2 below describes the measures that are in place to further mitigate adverse impacts associated with the Proposed Development on avian receptors.

As the Proposed Development is well within the range of the following SCI species (SNH 2016), there is potential for direct effect in the form of disturbance or displacement during the construction phase.

**Owenduff/Nephin Complex SPA**

- Merlin (*Falco columbarius*) [A098]
- Golden plover (*Pluvialis apricaria*) [A140]

#### 5.1.1.1.1 *Merlin*

The habitats in the study area, i.e., bog and conifer plantation, are suitable for supporting breeding merlin. While there was no evidence of merlin breeding in the study area, there was one on-site record in May 2020 and a number of sightings in autumn and winter. As merlin is a particularly difficult species to census and the traditionally used methods may not provide a true indication of the abundance, densities or distribution of the species (Lusby et al. 2011), it is possible that merlin could breed locally. Merlin is considered in the NatureScot (2022) review of disturbance distances in birds. The species is rated as of 'medium sensitivity' to disturbance, with a buffer zone of 300-500 m suggested for breeding birds. For disturbance by forestry operations, Currie & Elliot (1997) gave a distance range of 200 m to 400 m for merlin. Should merlin breed in future years within or close to the development area for the proposed wind farm, it is considered that the construction of the wind farm would likely have a potential disturbance effect on breeding birds within a distance of possibly up to 500 m from the construction area – this is rated as an Adverse Significant Effect of Short-term duration.

Due to the high conservation status of merlin, pre-construction survey will take place in all suitable breeding habitat which adjoins the site and as required, mitigation will be undertaken to reduce the significance of this potential effect on breeding birds (see section 5.4). It is considered unlikely that construction works would have effects on birds passing through the site in winter or during migration seasons as in these seasons the birds are highly mobile and tend to have large hunting ranges – significance of potential effect rated as Imperceptible or Not significant.

#### 5.1.1.1.2 *Golden Plover*

The blanket bogs to the west and southwest of the site provide habitat suitable for breeding golden plover. During the 2022 moorland survey an estimated total of two to three pairs were identified within a 1 km distance to the west of the site boundary (bog to southwest and south of site, which is potentially suitable for breeding golden plover, was not surveyed). The closest recorded pair was approximately 590 m from turbine Sh02.

Birds on passage or in winter may also land on the bog habitat though there is no evidence of birds regularly using the bogs in winter or on passage.

Golden plover is considered in the NatureScot (2022) review of disturbance distances in birds. The species is rated as of 'medium sensitivity' to disturbance, with a buffer zone of 200-500 m suggested for both breeding and non-breeding birds.

At the site for the Proposed Development, construction works will take place within a closest distance of approximately 100 m from open bog which provides habitat potentially suitable for breeding golden plover. Forestry will remain in situ between the work area and the start of bog. In places, the adjoining bog rises above the site for the wind farm and the proposed works would be highly visible to the birds in such areas.

From the above analysis, it is considered that the construction of the wind farm is likely to have a potential disturbance effect on breeding golden plover within a distance of possibly up to 500 m from the construction area – this is rated as an Adverse Significant Effect of Short-term duration. Due to the high conservation status of golden plover, and particularly considering the evidence of recent decline in the breeding population on bogs within the Slieve Fyagh SAC (Birch 2018), pre-construction survey will be carried out in all suitable breeding habitat which adjoins the site and, as required, mitigation will be undertaken to reduce the significance of this potential effect on breeding birds (see section 5.3.4.3)

It is considered unlikely that construction works would have effects on birds landing on the bog in winter or during migration seasons as in these seasons the birds are highly mobile and tend to settle only for short periods in any one particular location – significance of potential effect rated as Imperceptible or Not significant.

## 5.1.1.2 Displacement

### 5.1.1.2.1 *Merlin*

While there was no evidence of merlin breeding in the study area, there was one on-site record in May 2020 and a number of sightings in autumn and winter. It is considered that it is possible that merlin could breed locally but otherwise is an occasional visitor to the Proposed Development site.

There appears to be no data to show whether merlin is displaced from an area around turbines, though in the review of upland raptors and wind farms, for prairie falcon (Falco mexicanus) (same genus as merlin) Madders and Whitfield (2006) tentatively rated this North American falcon as having a 'low' sensitivity to displacement.

As merlin is a species that nests in trees or on open bog and hunts close to ground level, it is expected that the species will not be displaced from suitable habitat in the vicinity of turbines at the Proposed Development site - significance of potential effect rated as Not significant.

### 5.1.1.2.2 *Golden Plover*

The blanket bogs to the west of the site provide habitat suitable for breeding golden plover. Also, the bogs to the southwest of the site, which were not surveyed as part of the baseline studies, would be expected to potentially support breeding golden plover. Birds on passage or in winter may also land on the bog habitat though there is no evidence of birds regularly using the bogs in winter or on passage.

Pearce-Higgins et al. (2009) found that golden plover showed significant avoidance of turbines but that the avoidance was largely restricted to a distance of 200 m. However, in further review, Pearce-Higgins et al. (2012) found little evidence for consistent population declines in golden plover populations at wind farms sites. They note that populations may become habituated to operational wind farms, which is supported by the lack of decline in golden plover abundance at an upland wind farm over a 3-year period of operation (Douglas et al. 2011).

At the Proposed Development site, the closest distance of a turbine to the bog is 112 m, with only four turbines within a 200 m distance of the bog. In the 2022 moorland survey, the closest recorded breeding pair of golden plover to the wind farm was approximately 590 m (from turbine Sh02).

From the above and taking into account the high conservation status of golden plover as well as the documented recent population decline in the Slieve Fyagh SAC (Birch 2018), the significance of a potential displacement effect is rated as a Slight adverse effect.

It is considered unlikely that the presence of the wind farm would have adverse effects on golden plover landing on the local bog in winter or during migration seasons as in these seasons the birds are highly mobile and tend to settle only for short periods in any one particular location – significance of potential effect rated as Imperceptible or Not significant.

#### 5.1.1.3 Collision

The following SCO species for the SPAs where potential impacts could not be screened out were recorded within the study area:

- Merlin (*Falco columbarius*) (Owenduff/Nephin Complex SPA)

For this species, a summary of the estimated number of collisions over the lifetime (35 years) of the wind farm is given in the table below.

*Table 5-1. Summary of estimated number of collisions for Merlin over the lifetime of the project*

| SCI Species | Estimated Collisions over the Lifetime of Wind Farm | Estimated Collisions per Year | One Bird Collision |
|---|---|---|---|
| Merlin | 0.06 birds | 0.002 | 555 years |

For merlin, the predicted collision rate is imperceptible to negligible. Merlin is a species that is not considered prone to collision with turbines due to its flight behaviour which is typically low to the ground and below the rotor sweep. There appears to be few recorded merlin casualties with turbines, with only one cited in Germany by Hotker et al. (2006) in their review of all bird casualties at wind farms in Europe up to July 2004.

**On this basis and considering the recorded scarcity of the species during the various surveys at the Proposed Development site, the significance of collision risk is rated as an Imperceptible effect.**

### 5.1.2 Disturbance and Displacement of Otter

Due to the presence of suitable habitat within and immediately surrounding the Proposed Development site and due to the close proximity of the Proposed Development and grid connection route to the SAC, there is potential for *in* and *ex situ* disturbance and displacement of this QI species within this European Site during the construction phase:

- *Lutra lutra* (Otter) [1355]

Otter are crepuscular in nature and are unlikely to be adversely impacted by the proposed works. The NPWS Threat Response Plan for Otter acknowledges that "Little evidence has come to light in recent studies to suggest that disturbance by recreation is a significant pressure." It also identifies that Otter are known to travel significant distances from streams and lakes in search of new territory and feeding areas.

Chanin P (2003) provides a literary review with regard to anthropogenic disturbance and refers to several reports which have found that disturbance is not detrimental to Otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). The report also describes successful breeding in towns, under ferry terminals and under the jetties of one of Europe's largest oil and gas terminals at Sullom Voe in North Scotland.

Irish Wildlife Manual No 23 (National Otter Survey of Ireland 2004/2005) found no significant relationship between disturbance and otter occurrence. In addition, no significant difference in otter presence was found between sites with and without recreational activity. It also states, "the lowest percentage occurrence was found at the sites with the lowest recorded disturbance!"

Irish Wildlife Manual No 76 (National Otter Survey of Ireland 2010/2012) notes that the occurrence of Otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey &Rochford, 2006).

No breeding, resting or foraging sites for otter will be impacted. In addition, there is no potential for the Proposed Development to result in any barrier to the movement of aquatic species. Best practice disturbance limitation measures have been included in the project design and are described in Section 5.2.2.1 below.

Based on the above review of scientific literature, and on the best practice disturbance limitation measures to be put in place, the potential for adverse impact on the integrity of the otter population associated with the Owenduff/Nephin Complex SAC can be excluded.

No disturbance related impacts on otter will therefore occur.

### 5.1.3 Potential Impacts of Drainage and Hydrology

There is no surface water connection between the Proposed Development and the following European Sites (with the exception of Bellacorick Bog Complex SAC). However, due to the proximity of the Proposed Development to these sites, there is potential for indirect effects in the form of habitat degradation, e.g. drainage or hydrological changes arising from the movement of peat, compaction of soil and increase in impermeable surfaces.

There is potential for adverse effect during the construction, operational and decommissioning phases on the following QIs, in the absence of mitigation:

**Carrowmore Lake Complex SAC**

- Blanket bogs (* if active bog) [7130]
- Depressions on peat substrates of the Rhynchosporion [7150]

**Slieve Fyagh Bog SAC**

- Blanket bogs (* if active bog) [7130]

**Bellacorick Bog Complex SAC**

- Natural dystrophic lakes and ponds [3160] (Map 3 of the SSCOs – not all bog pools are mapped)
- 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]

**Glenamoy Bog Complex SAC**

- 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]
- Natural dystrophic lakes and ponds [3160]
- *Saxifraga hirculus* (Marsh saxifrage) [1528]

The potential hydrological and drainage impacts of the Proposed Development are fully described in section 9.4.3.2 of Chapter 9 and appendix 3 of this NIS.

The pre-mitigation potential effects of drainage/hydrology are described as: Indirect, negative, not significant, short-term, low probability, reversible.

### 5.1.4 Deterioration of Water Quality

Downstream surface water connection (about 10km surface water distance) with the Owenduff/Nephin Complex SAC has been identified via the watercourses that flow from the development site into the Owenmore River.

The Proposed Development has the potential to cause deterioration in surface water quality during the construction, operational and decommissioning phase of the development due to the release of pollutants including suspended solids and hydrocarbons, potentially affecting the following QIs in the absence of mitigation:

**Owenduff/Nephin Complex SAC**

- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

**Bellacorick Bog Complex SAC**
- *Vertigo geyeri* (Geyer's whorl snail) [1013]
- Natural dystrophic lakes and ponds [3160]
- Alkaline fens [7230]

The potential water quality effects of the Proposed Development are fully described in section 9.4.3.4 of Chapter 9 and appendix 3 of this NIS.

The pre-mitigation potential effects on water quality as described as: Indirect, negative, imperceptible, long-term, likely (high probability).

### 5.1.5 Dust Pollution

Taking a highly precautionary approach, due to the proximity of the proposed grid connection route to several designated sites, there is potential for indirect effects in the form of habitat deterioration from pollution with dust arising from the construction phase of the proposed development.

There is potential for adverse effect during the construction phase on the following QIs/SCIs or their supporting habitats in the absence of mitigation:

**Carrowmore Lake Complex SAC**

- Blanket bogs (* if active bog) [7130]
- Depressions on peat substrates of the Rhynchosporion [7150]

**Bellacorick Bog Complex SAC**

- 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]

**Owenduff/Nephin Complex SAC**

- Natural dystrophic lakes and ponds [3160]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- Alpine and Boreal heaths [4060]
- *Juniperus communis* formations on heaths or calcareous grasslands [5130]
- Blanket bogs (* if active bog) [7130]
- Transition mires and quaking bogs [7140]

**Owenduff/Nephin Complex SPA**

- Merlin (*Falco columbarius*) [A098]
- Golden plover (*Pluvialis apricaria*) [A140]

# 5.2 Mitigation

## 5.2.1 Mitigation employed to prevent impacts of drainage and hydrology

### 5.2.1.1 Mitigation by design

Development footprints have been reduced to a minimum which mains drainage is also reduced to the extent possible. The interceptor drains will be shallow, less than 1 mbgl. Keeping the drains shallow reduces the relative magnitude of drainage effects. The drainage system will be integrated with the existing network in the forest. The existing network is not causing issues with drainage of peat.

All construction will be supervised to ensure that the potential for excessive excavation depths are mitigated.

**Monitoring**

A network of up to 20 no. standpipes will be installed for monitoring of water levels in peat along the SAC boundaries. The purpose is to gauge potential effects. The standpipes will be measured manually on a monthly interval and a select set of 5 no. standpipes will be equipped with automatic data loggers for continuous water level measurement. The data will be periodically (quarterly) reviewed to assess whether effects are detected.

## 5.2.2 Mitigation employed to prevent Impacts on Water Quality

The prevention of impacts on water quality was considered in the design of all elements of the project and at all stages of the Proposed Development from pre-construction and site set up through to eventual decommissioning. The environmental management framework that will be adhered to during the construction phase of the development, including comprehensive detail regarding site set up, pollution prevention and hydrocarbon management, and incorporating the mitigating principles to ensure no adverse impact on the integrity of European Sites is described in the CEMP (Appendix 2 to this NIS).

All measures for the protection of water quality during the project design as well as construction, operational and decommissioning phases of the Proposed Development are set out in the following subsections.

### 5.2.2.1 Mitigation by design

The design of the Proposed Development, as described in Chapter 4 of the EIAR accompanying this application, sets out very clearly how the wind farm including the grid connection has been designed and will be operated in accordance with best industry practice to avoid any significant effects outside the site including the prevention of impacts on watercourses. This design includes suitable precautionary mitigation to make certain that the Proposed Development will not adversely affect the integrity of European sites.

The development has been designed to avoid effects on the watercourses that provide connectivity to relevant European Sites. This section demonstrates how this has been achieved

- The Proposed Development has been designed so that all infrastructure, except for access roads, is located over 50 metres from watercourses significant watercourses i.e. those mapped by the EPA[4].
- The upgrade of existing access tracks and construction of new tracks will involve some works within 50m of watercourses and new watercourse crossings. However, no instream works are proposed, and a suite of measures are in place to avoid any adverse effects on watercourses. These measures are described in full in the Chapter 9 'Water' of the EIAR that is included in full as Appendix 3 of this NIS. They are also described in Section 5.2 of this NIS.
- No vehicle or plant movement or stock-piling of construction materials or construction waste will take place within a 50-metre buffer zone around watercourses during the windfarm construction and no vegetation will be removed from within this zone.
- New site access roads have been designed to minimise excavation arisings, see Section 4.3.2.1 of the EIAR accompanying this application.
- The use of floating roads will result in no excavation and thus no peat arisings are generated. This will further minimise potential for suspended solids generation.
- The development has been designed to maintain a drainage neutral situation to avoid drainage related impacts (See Chapter 9: Water).
- Hard standing areas have been designed to the minimum size necessary to accommodate the turbine model that is selected.

In addition to the above, Fehily Timoney & Company (FT) undertook the peat stability assessment (included as Appendix 8-1 of the accompanying EIAR) following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2nd Edition, 2017). The Peat Hazard and Risk Assessment Guide (PHRAG) is used in this report as it provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

The following summary of the PSA is provided in Section 1 of the same report:

*In summary, the Sheskin South wind farm site has an acceptable margin of safety, is considered to be at low risk of peat failure and is suitable for wind farm development.*

#### 5.2.2.2 Construction Phase Mitigation

Mitigation measures have been incorporated into the Proposed Development for the prevention of water pollution. The Proposed Development includes a detailed drainage plan that is included as part of the planning application drawing pack. This plan and all the associated measures have been taken into account in this assessment. The drainage philosophy overall is to minimise waters arising on site, to adequately treat any water that may arise and to ensure that the hydrological function of the watercourses on the site and in the wider catchment are not affected by the proposed works. This philosophy including all associated mitigation measures to protect local surface water quality are fully described in the Construction and Environmental Management Plan (CEMP) and Chapter 9 ('Water' Chapter) of the EIAR, included as Appendix 2 and Appendix 3 respectively.

The Inland Fisheries Ireland (2016): *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*; and the Scottish Natural Heritage (SNH) *Good Practice During Wind Farm Construction* (SNH, 2019, 4th Edition) will also be adhered to.

All detailed mitigation measures for the protection of water quality are fully described below and in Section 4.7 of the accompanying EIAR, the CEMP (included as an Appendix 2) and Section 9.5, Chapter 9 of the EIAR (provided here in Appendix 3). The following subsections describe the mitigation measures proposed for the construction phase of the proposed development.

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[4] *EPA, 2020, Online map viewer, https://gis.epa.ie/EPAMaps/*

#### 5.2.2.2.1 Clear-span watercourse crossing construction methodology and associated mitigation

It is proposed to construct clear-span crossings watercourse/service crossings along the wind farm access roads at 11no. locations using a bottomless box culvert. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 of the EIAR accompanying this application. The clearspan watercourse/service crossing methodologies presented below will ensure that no instream works are necessary.

The construction methodology for the installation of a pre-cast concrete bottomless box culvert crossing is included in Section 2.4.14 of the CEMP, included as Appendix 2 of this NIS.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Confirmatory inspections of each proposed new watercourse crossing location will be carried out by the project civil/structural engineer and the project hydrologist prior to the construction of each crossing.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within suitable backfill material.

#### 5.2.2.2.2 Grid Connection Watercourse/Culvert Crossings

Three bridge crossing locations and nine culvert crossing locations have been identified along the grid connection cabling route.

It is proposed to cross two bridge crossings using Horizontal Directional Drilling (HDD). It is proposed to cross one of the watercourses in flat-bed formation within the bridge deck following the replacement of current bridge deck.

The locations of the bridge and culvert are shown on the site layout drawings submitted with this planning application. The schedule of culvert crossing methodologies is shown in Appendix A of Appendix 4-5 of the EIAR accompanying this application.

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled "Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the proposed development.

The HDD and bridge deck replacement methodologies are included in Section 2.4.12.3 of the CEMP, included as Appendix 2 of this NIS.

#### 5.2.2.2.3 Construction phase drainage management

The following best practice drainage measures have been incorporated into the Proposed Development during the various stages of construction for the protection of surface water quality. These mitigation measures are fully described in section 9.5.2.1 of Chapter 9 and are summarized below.

##### Keyhole felling of Coniferous Plantation

- Silt traps will be strategically placed downgradient within forestry drains near streams. The purpose is to slow water flow, increase residence time, and allow settling of silt.
- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance.
- Checking and maintenance of roads and culverts will be on-going throughout felling activity. No tracking of vehicles through watercourses will occur as vehicles will use road infrastructure and existing watercourse crossing points. Existing drains will also not be disturbed.
- Dust will be suppressed during dry spells.
- Ditches which drain water from felled areas towards existing surface water courses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (c. 0.3%-3% gradient) to minimise flow velocities. Main drains that accommodate the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and will avoid being placed at right angles to topographic contours.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in dedicated disposal areas.
- On steep slopes and where felling inside the 50 metre buffer is required, it will be necessary to install double or triple sediment traps. All drainage channels will taper out before entering the buffer zone. This ensures that discharged water fans out over the buffer zone before entering the aquatic zone, with sediment filtered out by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, outside of the buffer zone.
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled.

- Brash mats will be used to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion, extraction will be suspended during periods of high rainfall.
- Timber will be stacked in dry areas and outside a 50 metre buffer. Straw bales and check dams will be emplaced on the downgradient side of timber storage/processing sites.
- Works will not be carried out during significant rainfall events (see Section ____) in order to minimise entrainment of exposed sediment in surface water run-off.
- Refuelling or maintenance of machinery will not occur within 50m of a watercourse. Mobile bowser, spill kits, qualified personnel will be used where refuelling is required.
- A permit to refuel system will be adopted.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.
- Crossing of streams away from bridges and culverts will not be permitted.

### Earthworks

- Source controls:
  - Interceptor drains, diversion drains, flume pipes, straw bales and silt fences, and velocity control measures (sand bags, oyster bags filled with gravel).
  - Keeping working areas small, covering stockpiles, cessation of works.
- In-Line controls:
  - Interceptor drains, oversized swales, and velocity control measures (sand bags, oyster bags, flow limiters, weirs, baffles..
- Treatment systems:
  - Attenuation/stilling ponds, sediment traps, and if necessary, proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.

The existing network of forestry and roadside drains will be integrated with the proposed drainage system. The main elements of interaction between the two will be:

- Apart from interceptor drains, which will convey greenfield runoff to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction and attenuation for flow management) of runoff into the existing site drainage network. This will reduce the potential for risk of downstream flooding or sediment transport/erosion.
- Runoff from individual turbine hardstanding areas will not be discharged into the existing drain network but discharged locally at each turbine location via new swales to 'dirty water' stilling ponds, with buffered outfalls onto vegetated surfaces.
- Buffered outfalls will promote percolation of drainage waters across vegetation.
- Drains running parallel to roads that require widening will be upgraded. Erosion and velocity control measures will be used, including check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, and baffles. Regular buffered outfalls will also be added to these drains to protect surface water courses.

#### Cement based products control measures

- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement-contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined Siltbuster-type cement washout ponds, or equivalent (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/)
- Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. These are covered when not in use to prevent rainwater collecting.
- Pour sites of cement will be kept free of standing water, and plastic covers will be ready in case of sudden rainfall events.

Concrete deliveries are often carried out outside of normal working hours in order to limit traffic effects on roads. Concrete pouring for turbine foundations is normally complete in a single day per turbine.

Risks of pollution will be further reduced as follows:

- Concrete will not be transported around the site in open trailers or dumpers so as to avoid spillage while in transport.
- All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.
- Arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.
- Weather forecasting will be used to assist in planning large concrete pours and large pours will be avoided where prolonged periods of heavy rain is forecast..
- Concrete pumps and machine buckets from slewing over watercourses will be restricted while placing concrete.
- Excavations will be sufficiently dewatered before concreting begins and dewatering will continue while concrete sets.
- Covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Any potential, small surplus of concrete will be disposed of after completion of a pour in suitable locations away from any watercourse or sensitive habitats.

### 5.2.2.2.4 *Monitoring*

As described in the CEMP, see Appendix 2 of the NIS, daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment undertaken.

Turbidity monitors, or sondes, will be installed at locations surrounding the wind farm site. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring at their locations. This will be supplemented by field chemistry measurements. The suite of determinants will include:

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Total Phosphorus
- Chloride
- Nitrate
- Nitrite
- Total Nitrogen
- Ortho-Phosphate
- Ammonia N
- Biochemical Oxygen Demand
- Total Suspended Solids

The above measures will both determine that the proposed mitigation measure are working as planned as well as informing the need for any alterations to the onsite mitigation and drainage design. All such measures will be overseen and implemented by a dedicated project Environmental Clerk of Works.

### 5.2.2.3 Operation Phase Mitigation

The operational phase drainage measures incorporated into the Proposed Development design will remain in place for the duration of the project to avoid any potential operational phase run-off from hard stands. Details of all proposed drainage measures incorporated into the Proposed Development are fully described in Section 4.7, Chapter 4 of the EIAR, Section 9.5.4, Chapter 9 '*Water*' (Appendix 3) and Section 3.2.3 of the Surface Water Management Plan, available in appendix 4-4 of the EIAR. The below measures are a summary of the main water protection measures incorporated into the design of the proposed development. They will be installed and constructed in conjunction with the road and hardstanding construction work as described below:

- Some interceptor drains will be left in place, upgradient of the proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader.
- Swales/road side drains will remain in place to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to stilling ponds for sediment settling;
- Check dams will be put in place at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Stilling ponds/settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. The stilling ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. Inspection and maintenance of all settlement ponds, along with the entire drainage network, will be ongoing through the construction period.

With the implementation of the proposed wind farm drainage measures as outlined above, there will be no potential for impact on downstream watercourses and thus no potential for adverse effect on downstream EU designated sites.

### 5.2.2.4 Decommissioning Phase Mitigation

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the Proposed Development may be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Site roadways will be left in situ, as appropriate. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required. Underground cables, including grid connection, will be removed and the ducting left in place. A decommissioning plan will be agreed with the local authorities three months prior to decommissioning the Proposed Development.

## 5.2.3 Mitigation employed to prevent impacts of Dust Pollution

As described in section 5.3, on a precautionary basis, there is potential for indirect effects on several European Sites in the form of habitat deterioration from pollution with dust arising from the construction phase of the proposed development.

Mitigation measures to prevent dust pollution have been fully described in section 10.2.4.3.2 of Chapter 10 'Air and Climate' and section 3.6 of the CEMP. These measures are summarized below.

Proposed measures to control dust will be implemented in full and include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions. Silty or oily water will not be used for dust suppression.
- Construction traffic will be restricted to defined routes and a speed limit implemented.
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the ECoW for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness will be undertaken.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,

- All vehicles leaving the construction areas of the site will pass through a wheel washing area prior to entering the local road network.

With the implementation of the proposed dust control measures as outlined above, there will be no potential for impact of dust pollution and thus no potential for adverse effect on downstream EU designated sites.

## 5.2.4 Disturbance and Displacement to SCI species

### 5.2.4.1 Pre-construction survey

The mitigation measures employed to prevent disturbance and displacement of SCI species are fully described in appendix 7-1 of the EIAR accompanying this application.

During the breeding season (March-August) bird monitoring surveys within the Proposed Development site will take place to a distance of 500 m from the development area. However, for the bogs to the west of site, the survey that was carried out in 2022 will be repeated, with transects up to 1,000 m from the edge of the forest. The purpose of the surveys is to confirm the locations of breeding territories prior to construction to ensure that mitigation is successfully implemented (see Section 5.2.4.2 below) to avoid disturbance effects on breeding activities as a result of the works.

It is noted that the wet bog to the southwest and south of the site had not been included in the 2022 survey for health and safety reasons. The assumption has been made that sensitive breeding species may be present (as habitat is certainly suitable to support same) and a restrictive zone of 500 m from the forest/bog edge will be implemented during the breeding season as a precautionary measure.

The survey for breeding birds on the bog (following Brown and Shepherd 1993) will take place in the April to July period (4 visits) in the season before works, including tree felling, commence. This schedule will provide requirements to the contractor on where restrictive zones will be avoided

### 5.2.4.2 Mitigation during construction

Should Merlin or Golden Plover be recorded breeding within the given distances of the works area (as established through confirmatory surveys before and/or during construction – see Sections 5.6 & 5.7 of the Bird Impact Assessment Report prepared by Malachy Walsh and Brian Madden (appendix 7-1) accompanying EIAR), a buffer zone of 500m shall be established around the expected location of the nest (location identified as far as is possible without causing disturbance to the bird) and all works will be restricted within the zone until it can be demonstrated by an ornithologist that the species has completed the breeding cycle in the identified area. Any restricted area that is required to be set up will be marked clearly using hazard tape fencing and all site staff will be alerted through toolbox talks.

### 5.2.4.3 Mitigation during operation

A detailed post-construction Bird Monitoring Programme has been prepared for the operational phase of the Proposed Development, please refer to Appendix 7-1 of the EIAR for further details. The programme of works will monitor parameters associated with collision, displacement/barrier effects and habituation and these surveys will be scheduled to coincide with Years 1, 2, 3, 5, 10 & 15 of the lifetime of the wind farm. Monitoring measures are broadly based on guidelines issued by the Scottish Natural Heritage (SNH, 2009). The following individual components are proposed for monitoring years:

- Monthly flight activity surveys: vantage point surveys
- Distribution and abundance surveys: breeding wader to a 500m radius of the development area, breeding hen harrier surveys and winter hen harrier roost surveys to a 2km radius of the development area.
- Targeted bird collision surveys (corpse searches) will be undertaken with training dogs. The surveys will include detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.

The monitoring measures will include:

- Monthly flight activity surveys: vantage point surveys.
- Breeding Bird surveys: Adapted Brown & Shepard
- Targeted bird collision surveys (corpse searches) will be undertaken with trained dogs. The surveys will include detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.

### 5.2.5 Disturbance to Otter

Taking a precautionary approach, a potential pathway for indirect effects on otter associated with Owenduff/Nephin Complex SACs has been identified as a result of disturbance associated with the construction, operation and decommissioning phase of the proposed works. A pre-commencement otter survey has therefore also been specified (see below).

The Proposed Development site is located upstream of Owenduff/Nephin Complex which is designated for otter. Therefore, the potential for indirect effects on otter in term of disturbance/displacement, where they occur outside of the SAC in close proximity to the proposed development, were identified for further assessment. Although it is judged unlikely that any otters present within the vicinity of works within the Proposed Development site would be associated with populations for which these SACs have been designated, mitigation has been provided following a precautionary approach.

In relation to disturbance, otter are predominantly crepuscular in nature and given that construction activity will mostly be confined to daytime hours, this will minimize the potential for disturbance related impacts to the species. Chanin P (2003) provides a literary review with regard to anthropogenic disturbance and refers to several reports which have found that disturbance is not detrimental to otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). Irish Wildlife Manual No 76 (National Otter Survey of Ireland 2010/2012) notes that the occurrence of otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey &Rochford, 2006).

#### 5.2.5.1 Best Practice Preventive Measures

Although signs of otter were recorded i.e. a scats, along the Owenkillew River, which occurs adjacent to the proposed grid connection route, no otter holts were recorded and it is therefore likely that the watercourses occurring within the site do not support a significant otter population. From a highly precautionary perspective, best practice measures have been incorporated into the proposed works in order to avoid or minimise any potential for indirect effect on the species.

Turbine locations have been selected to avoid natural watercourses (located over 50 metres from EPA mapped watercourses). Only minor culvert upgrade works are proposed. Works to existing bridges will be temporary in nature and will not block the channel. Therefore, there is no potential for the Proposed Development to result in any barrier to the movement of otter.

### 5.2.5.2 Pre-Construction Otter Survey

From a highly precautionary perspective, prior to any works being carried out, a pre-construction Otter survey will be undertaken by a qualified ecologist to ensure that Otter has not taken up residence within or close to the proposed works area. Should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006) in consultation with the National Parks and Wildlife Service (NPWS).

It is not anticipated that disturbance/displacement related impacts will prevent or obstruct otter from reaching favourable conservation status as per Article 1 of the EU Habitats Directive.

# 6. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

The potential for adverse effects on each of the individual Qualifying Interests that were identified as being at risk of potential effects in the AA Screening Report is assessed in this section in view of the Conservation Objectives of those habitats and species.

## 6.1 Carrowmore Lake Complex SAC [000476]

A site-specific conservation objective supporting document is available for Carrowmore Lake Complex SAC [000476] (NPWS, 2017a) and the site-specific targets and attributes provided in this document have been assessed below in the following sub-sections.

### 6.1.1 *Blanket bogs (*if active bog) [7130]*

*Table 6-1 Extrapolated Targets and Attributes associated with site specific conservation objectives for blanket bogs [7130]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Ecosystem function: peat formation | At least 99% of the total Annex I blanket bog area is active | |
| Ecosystem function: hydrology | Natural hydrology unaffected by drains and erosion | |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least seven | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: lichens and bryophytes | Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10% | incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure of the habitat to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |

| Attribute | Target | Assessment |
|---|---|---|
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.1.2 *Depressions on peat substrates of the Rhynchosporion [7150]*

*Table 6-2 Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for Depressions on peat substrates of the Rhynchosporion [7150]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status or vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least five | |
| Vegetation composition: *Rhynchospora* spp. | Total cover of white beaked sedge (*Rhynchospora alba*), and brown beaked sedge (*R.* fusca) at least 10% | |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 35% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure of the habitat to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.1.3 Determination on Potential Adverse Effects on Carrowmore Lake SAC

Based on the above review of the individual QIs and following implementation of best practice and mitigation measures described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SAC.

## 6.2 Slieve Fyagh Bog SAC [000542]

A site-specific conservation objective supporting document is available for Slieve Fyagh Bog SAC [000542] (NPWS, 2016) and the site-specific targets and attributes provided in this document have been assessed below in the following sub-section.

### 6.2.1 Blanket bogs (*if active bog) [7130]

*Table 6-3 Extrapolated Targets and Attributes associated with site specific conservation objectives for blanket bogs [7130]*

<table>
<tr><th>Attribute</th><th>Target</th><th>Assessment</th></tr>
<tr><td>Habitat area</td><td>Area stable or increasing, subject to natural processes</td><td rowspan="2">There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development.</td></tr>
<tr><td>Habitat distribution</td><td>No decline, subject to natural processes</td></tr>
<tr><td>Ecosystem function: soil nutrients</td><td>Maintain soil nutrient status within natural range</td><td>There are no pathways arising from the Proposed Development that would allow changes to the soil nutrient status of the habitat within this SAC to occur.</td></tr>
<tr><td>Ecosystem function: peat formation</td><td>At least 99% of the total Annex I blanket bog area is active</td><td rowspan="2">There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development.</td></tr>
<tr><td>Ecosystem function: hydrology</td><td>Natural hydrology unaffected by drains and erosion</td></tr>
</table>

| Attribute | Target | Assessment |
|---|---|---|
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least seven | |
| Vegetation composition: lichens and bryophytes | Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10% | |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure of the habitat to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | |

| Attribute | Target | Assessment |
|---|---|---|
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.2.2 Determination on Potential Adverse Effects on Slieve Fyagh SAC

Based on the above review of the individual QIs and following implementation of best practice and mitigation measures described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SAC.

## 6.3 Glenamoy Bog Complex SAC [000500]

A site-specific conservation objective supporting document is available for Glenamoy Bog Complex SAC [000500] (NPWS, 2017b) and the site-specific targets and attributes provided in this document have been assessed below in the following sub-sections.

### 6.3.1 Natural dystrophic lakes and ponds [3160]

*Table 6-4 Targets and Attributes associated with nominated site-specific conservation objectives for* natural dystrophic lakes and ponds *[3160]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes. | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed |
| Habitat distribution | No decline, subject to natural processes | |

| Attribute | Target | Assessment |
| --- | --- | --- |
| | | CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Typical species | Typical species present, in good condition, and demonstrating typical abundances and distribution | There will be no change to the typical species composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP,, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: characteristic zonation | All characteristic ones should be present, correctly distributed and in good condition | There will be no change to the vegetation composition or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation distribution: maximum depth | Maintain maximum depth of vegetation, subject to natural processes | |
| Hydrological regime: water level fluctuations | Maintain appropriate natural hydrological regime necessary to support the habitat | There will be no change to the hydrological regime of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Lake substratum quality | Maintain appropriate substratum type, extent and chemistry to support the vegetation | There are no pathways arising from the Proposed Development that would allow changes to the lake substratum quality of the habitat within this SAC to occur. |
| Water quality: transparency | Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency | There are no pathways arising from the Proposed Development that would allow changes to the water quality of the habitat within this SAC to occur. |

| Attribute | Target | Assessment |
|---|---|---|
| Water quality: nutrients: | Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species | |
| Water quality: phytoplankton biomass | Maintain appropriate water quality to support the habitat, including high chlorophyll a status | |
| Water quality: phytoplankton composition | Maintain appropriate water quality to support the habitat, including high phytoplankton composition status | |
| Water quality: attached algal biomass | Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status | |
| Water quality: macrophyte status | Maintain high macrophyte status | |
| Acidification status | Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes | There are no pathways arising from the Proposed Development that would allow changes to the physical properties of the habitat within this SAC to occur. |
| Water colour | Maintain appropriate water colour to support the habitat | |
| Dissolved Organic Carbon (DOC) | Maintain appropriate organic carbon levels to support the habitat | |
| Turbidity | Maintain appropriate turbidity to support the habitat | |
| Fringing habitat: area and condition | Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3160 | There will be no change to the area or condition of fringing habitats associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation |

| Attribute | Target | Assessment |
|---|---|---|
| | | during any phase of the proposed development. |

## 6.3.2 Northern Atlantic wet heaths with *Erica tetralix* [4010]

*Table 6-5 Targets and Attributes associated with nominated site-specific conservation objectives for northern Atlantic wet heaths with Erica tetralix [4010]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There are no pathways arising from the Proposed Development that would allow changes to the soil nutrient status of the habitat within this SAC to occur. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: cross-leaved heath | Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop | |
| Vegetation composition: positive indicator species | Cover of positive indicator species at least 50% | |
| Vegetation composition: lichens and bryophytes | Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10% | |
| Vegetation composition: ericoid species and crowberry | Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: dwarf shrub species | Cover of dwarf shrubs less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 20% | |
| Vegetation composition: bracken | Cover of bracken (*Pteridium aquilinum*) less than 10% | |
| Vegetation composition: soft rush | Cover of soft rush (*Juncus effusus*) less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure of the habitat to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |

| Attribute | Target | Assessment |
|---|---|---|
| | | during any phase of the proposed development. |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.3.3 *Juniperus communis* formations on heaths or calcareous grasslands [5130]

*Table 6-6 Targets and Attributes associated with nominated site-specific conservation objectives for* Juniperus communis formations on heaths or calcareous grasslands [5130]

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Juniper population size | At least 50 plants per formation | There will be no decline in the number of juniper plants within this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: typical species | At least 50% of the listed positive indicator species for the relevant vegetation group present | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | There will be no composition or structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: cone-bearing plants | At least 10% of juniper plants are bearing cones | |
| Vegetation structure: seedling recruitment | At least 10% of juniper plants are seedlings | |
| Vegetation structure: dead juniper | Mean percentage of each juniper plant dead less than 10% | |

## 6.3.4 Blanket bogs (*if active bog) [7130]

*Table 6-7 Extrapolated Targets and Attributes associated with site specific conservation objectives for blanket bogs [7130]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There are no pathways arising from the Proposed Development that would allow changes to the soil nutrient status of the habitat within this SAC to occur. |
| Ecosystem function: peat formation | At least 99% of the total Annex I blanket bog area is active | There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Ecosystem function: hydrology | Natural hydrology unaffected by drains and erosion | |

| Attribute | Target | Assessment |
|---|---|---|
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least seven | |
| Vegetation composition: lichens and bryophytes | Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10% | |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur as a result of the proposed development. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | |

| Attribute | Target | Assessment |
|---|---|---|
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.3.5 Transition mires and quaking bogs [7140]

*Table 6-8 Extrapolated Targets and Attributes associated with site specific conservation objectives for transition mires and quaking bogs [7140]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There are no pathways arising from the Proposed Development that would allow changes to the soil nutrient status of the habitat within this SAC to occur. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: number of positive indicator species | Number of positive indicator species present at each monitoring stop is at least three for infilling pools and flushes and at least six for fens | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: number of core positive indicator species | At least one core positive indicator species present | |
| Vegetation composition: cover of positive indicator species | Total cover of positive indicator species is at least 25% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation structure: height | Proportion of live leaves and/or flowering shoots of vascular plants that are more than 15cm above the ground surface should be at least 50% | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been |

| Attribute | Target | Assessment |
|---|---|---|
| | | incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.3.6 Depressions on peat substrates of the Rhynchosporion [7150]

*Table 6-9 Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for* Depressions on peat substrates of the Rhynchosporion *[7150]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There are no pathways arising from the Proposed Development that would allow changes to the soil nutrient status of the habitat within this SAC to occur. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least five | There will be no change to the vegetation composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: *Rhynchospora* spp. | Total cover of white beaked sedge (*Rhynchospora alba*), and brown beaked sedge (*R.* fusca) at least 10% | |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 35% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur as a result of the proposed development. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.3.7 Marsh Saxifrage *Saxifraga hirculus* [1528]

*Table 6-10 Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for* Marsh Saxifrage *Saxifraga hirculus [*1528*]*

| Attribute | Target | Assessment |
|---|---|---|
| Distribution of populations | No loss in geographical spread and number of populations, subject to natural processes. See map 4 for 1km grid square locations | There will be no decline in the distribution or size of Marsh saxifrage populations within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP,  a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Population size: number of rosettes | Maintain the size of each known population, subject to natural processes. The target numbers of rosettes are: at least 2,800 at Largan Mor A, at least 440 at Largan Mor B and at least 80 at Largan Mor C | |
| Population size: area of occupancy | Maintain the area of occupancy of each known population, subject to natural processes. The target areas are: at least 0.0084ha at Largan Mor A, at least 0.00045ha at Largan Mor B and at least 0.00027ha at Largan Mor C | |
| Hydrological conditions: water level | Maintain the appropriate natural hydrological regime necessary to support the habitat for the species | There will be no change to the hydrological conditions of supporting habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Knotted pearlwort (*Sagina nodosa*) should be present in at least two of five 1m x 1m monitoring stops | There will be no change to the vegetation composition of supporting habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: negative indicator species | Mean percentage cover of purple moor-grass (*Molinia caerulea*) should not exceed 5%; mean percentage cover of Yorkshire fog (*Holcus lanatus*) should not exceed 15% | |
| Vegetation structure: sward height | Maintain a mean vegetation height of less than 15cm | There are no pathways arising from the Proposed Development that would allow |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation structure: grazing level | Maintain grazing at light to moderate levels to ensure an open vegetation structure and to allow flowering to occur | changes to the vegetation structure to occur as a result of the proposed development. |

### 6.3.8 Determination on Potential Adverse Effects on Glenamoy Bog Complex SAC

Based on the above review of the individual QIs and following implementation of best practice and mitigation measures described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SAC.

## 6.4 Bellacorick Bog Complex SAC [001922]

A site-specific conservation objective supporting document is available for Bellacorick Bog Complex SAC [001922] (NPWS, 2017c) and the site-specific targets and attributes provided in this document have been assessed below in the following sub-sections.

### 6.4.1 Natural dystrophic lakes and ponds [3160]

*Table 6-11 Targets and Attributes associated with nominated site-specific conservation objectives for* natural dystrophic lakes and ponds *[3160]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes. | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Typical species | Typical species present, in good condition, and demonstrating typical abundances and distribution | There will be no change to the typical species composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of |

| Attribute | Target | Assessment |
|---|---|---|
| | | water quality during any phase of the proposed development. |
| Vegetation composition: characteristic zonation | All characteristic ones should be present, correctly distributed and in good condition | There will be no change to the vegetation composition or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Vegetation distribution: maximum depth | Maintain maximum depth of vegetation, subject to natural processes | |
| Hydrological regime: water level fluctuations | Maintain appropriate natural hydrological regime necessary to support the habitat | There will be no change to the hydrological regime of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Lake substratum quality | Maintain appropriate substratum type, extent and chemistry to support the vegetation | There will be no change to lake substratum or water quality of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Water quality: transparency | Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency | |
| Water quality: nutrients: | Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species | |
| Water quality: phytoplankton biomass | Maintain appropriate water quality to support the habitat, including high chlorophyll a status | |
| Water quality: phytoplankton composition | Maintain appropriate water quality to support the habitat, including high phytoplankton composition status | |

| Attribute | Target | Assessment |
|---|---|---|
| Water quality: attached algal biomass | Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status | |
| Water quality: macrophyte status | Maintain high macrophyte status | |
| Acidification status | Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes | There will be no change to the physical properties of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Water colour | Maintain appropriate water colour to support the habitat | |
| Dissolved Organic Carbon (DOC) | Maintain appropriate organic carbon levels to support the habitat | |
| Turbidity | Maintain appropriate turbidity to support the habitat | |
| Fringing habitat: area and condition | Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3160 | There will be no change to the area or condition of fringing habitats associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.4.2 Northern Atlantic wet heaths with *Erica tetralix* [4010]

*Table 6-12 Targets and Attributes associated with nominated site-specific conservation objectives for northern Atlantic wet heaths with Erica tetralix [4010]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed |
| Habitat distribution | No decline, subject to natural processes | |

| Attribute | Target | Assessment |
|---|---|---|
| | | CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: cross-leaved heath | Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop | |
| Vegetation composition: positive indicator species | Cover of positive indicator species at least 50% | |
| Vegetation composition: lichens and bryophytes | Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10% | |
| Vegetation composition: ericoid species and crowberry | Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15% | |
| Vegetation composition: dwarf shrub species | Cover of dwarf shrubs less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 20% | |
| Vegetation composition: bracken | Cover of bracken (*Pteridium aquilinum*) less than 10% | |
| Vegetation composition: soft rush | Cover of soft rush (*Juncus effusus*) less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur as a result of the proposed development. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental |

| Attribute | Target | Assessment |
| --- | --- | --- |
| | | control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.4.3 Blanket bogs (*if active bog) [7130]

*Table 6-13 Extrapolated Targets and Attributes associated with site specific conservation objectives for blanket bogs [7130]*

| Attribute | Target | Assessment |
| --- | --- | --- |
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Ecosystem function: peat formation | At least 99% of the total Annex I blanket bog area is active | |
| Ecosystem function: hydrology | Natural hydrology unaffected by drains and erosion | |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least seven | |
| Vegetation composition: lichens and bryophytes | Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10% | |
| Vegetation composition: | Cover of each of the potential dominant species less than 75% | |

| Attribute | Target | Assessment |
|---|---|---|
| potential dominant species | | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur as a result of the proposed development. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental |

| Attribute | Target | Assessment |
|---|---|---|
| | | control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.4.4 Depressions on peat substrates of the Rhynchosporion [7150]

*Table 6-14 Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for* Depressions on peat substrates of the Rhynchosporion *[7150]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC. As described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status or vegetation diversity and composition of this habitat within the SAC. As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least five | |
| Vegetation composition: *Rhynchospora* spp. | Total cover of white beaked sedge (*Rhynchospora alba*), and brown beaked sedge (*R.* fusca) at least 10% | |
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 35% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.4.5 Alkaline fens [7230]

*Table 6-15 Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for* Alkaline fens *[7230]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil pH and nutrient status within natural ranges | There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Ecosystem function: soil nutrients | Maintain active peat formation, where appropriate | |
| Ecosystem function: hydrology – groundwater levels | Maintain, or restore where necessary, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat | |
| Ecosystem function: hydrology – surface water flow | Maintain, or restore where necessary, as close as possible to natural or seminatural drainage conditions | |
| Ecosystem function: water quality | Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat | |
| Vegetation composition: community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation composition or structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation |
| Vegetation composition: typical brown mosses | Maintain adequate cover of typical brown moss species | |
| Vegetation composition: typical vascular plants | Maintain adequate cover of typical vascular plant species | |

| | | |
|---|---|---|
| Vegetation composition: native negative indicator species | Cover of native negative indicator species at insignificant levels | during any phase of the proposed development. |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: algal cover | Cover of algae less than 2% | |
| Vegetation structure: vegetation height | At least 50% of the live leaves/flowering shoots are more than either 5cm or 15cm above ground surface depending on community type | |
| Physical structure: disturbed bare ground | Cover of disturbed bare ground not more than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: tufa formations | Disturbed proportion of vegetation cover where tufa is present is less than 1% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes or rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Transitional areas between fen and adjacent habitats | Maintain adequate transitional area to support/protect the alkaline fen habitat and the services it provides | There will be no change to transitional areas between this habitat and ajacent habitats within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed |

| | | |
|---|---|---|
| | | CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.4.6 Determination on Potential Adverse Effects on Bellacorick Bog Complex SAC

Based on the above review of the individual QIs and following implementation of best practice and mitigation measures described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SAC.

## 6.5 Owenduff/Nephin Complex SAC [000534]

A site-specific conservation objective supporting document is available for Owenduff/Nephin Complex SAC [000534] (NPWS, 2017d) and the site-specific targets and attributes provided in this document have been assessed below in the following sub-sections.

### 6.5.1 *Salmo salar* (Salmon) [1106]

*Table 6-16* Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for *Salmo salar* (Salmon) [1106]

| Attribute | Target | Assessment |
|---|---|---|
| Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | There will be no reduction in the distribution of extent of anadromy given that there will be no instream works or alterations to river morphology and structures which could limit habitat accessibility. |
| Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | There will be no reduction in the number of adult spawning and salmon fry or decline in out-migrating smolt or number and distribution of redds.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |
| Salmon fry abundance | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/ 5 minutes sampling | |
| Out-migrating smolt abundance | No significant decline | |
| Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | |

| Attribute | Target | Assessment |
|---|---|---|
| Water quality | At least Q4 at all sites sampled | There will be no deterioration of water quality.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |

### 6.5.2 *Lutra lutra* (Otter) [1355]

*Table 6-17* Extrapolated Targets and attributes associated with nominated site-specific conservation objectives for *Lutra lutra* (Otter) [1355]

| Attribute | Target | Assessment |
|---|---|---|
| Distribution | No significant decline | There will be no decline in the distribution of the otter population for which the SAC has been designated as a result of the proposed development.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the proposed development. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |
| Extent of terrestrial habitat | No significant decline. Area mapped and calculated as 840.63ha along riverbanks/lake shoreline/around pools | The Proposed Development will not result in the loss of any supporting habitat anywhere within the SAC as it is located on the opposite side of the Owenmore River of the designated site. There will be no instream works and there is no major infrastructure within 50m of any natural watercourse. |
| Extent of freshwater (river) habitat | No significant decline. Length mapped and calculated as 382.65km | |

| Attribute | Target | Assessment |
|---|---|---|
| Extent of freshwater (lake) habitat | No significant decline. Area mapped and calculated as 540.66ha | |
| Couching sites and holts | No significant decline | There will be no loss of holting or couching sites within the SAC as the Proposed Development is located on the opposite side of the Owenmore River of the designated site. In addition, no holting or couch sites were recorded on the site of the Proposed Development during either the dedicated otter surveys of the site and fisheries surveys. |
| Fish biomass available | No significant decline | There will be no decline in availability of fish biomass associated with the proposed development.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |
| Barriers to connectivity | No significant increase. | There will be no barriers created as a result of this development as there will be no instream works and there is no major infrastructure within 50m of any natural watercourse.<br><br>No potential for disturbance or commuting potential to the species is expected as result of the proposed development. Section 5.4 of this NIS describes the measures incorporated into the Proposed Development for the protection of water quality both within and downstream of the site during all phases of the proposed development. This includes for the installation of bottomless culverts where watercourse crossings are required. |

### 6.5.3 Natural dystrophic lakes and ponds [3160]

*Table 6-18 Targets and Attributes associated with nominated site-specific conservation objectives for* natural dystrophic lakes and ponds [3160]

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes. | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Typical species | Typical species present, in good condition, and demonstrating typical abundances and distribution | There will be no change to the typical species composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Vegetation composition: characteristic zonation | All characteristic ones should be present, correctly distributed and in good condition | There will be no change to the vegetation composition or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Vegetation distribution: maximum depth | Maintain maximum depth of vegetation, subject to natural processes | |
| Hydrological regime: water level fluctuations | Maintain appropriate natural hydrological regime necessary to support the habitat | There will be no change to the hydrological regime of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

| Attribute | Target | Assessment |
|---|---|---|
| Lake substratum quality | Maintain appropriate substratum type, extent and chemistry to support the vegetation | There will be no change to lake substratum or water quality of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Water quality: transparency | Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency | |
| Water quality: nutrients: | Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species | |
| Water quality: phytoplankton biomass | Maintain appropriate water quality to support the habitat, including high chlorophyll a status | |
| Water quality: phytoplankton composition | Maintain appropriate water quality to support the habitat, including high phytoplankton composition status | |
| Water quality: attached algal biomass | Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status | |
| Water quality: macrophyte status | Maintain high macrophyte status | |
| Acidification status | Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes | There will be no change to the physical properties of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Water colour | Maintain appropriate water colour to support the habitat | |
| Dissolved Organic Carbon (DOC) | Maintain appropriate organic carbon levels to support the habitat | |
| Turbidity | Maintain appropriate turbidity to support the habitat | |

| Attribute | Target | Assessment |
|---|---|---|
| Fringing habitat: area and condition | Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3160 | There will be no change to the area or condition of fringing habitats associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.5.4 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

*Table 6-19 Targets and Attributes associated with nominated site-specific conservation objectives for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes. | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or deterioration of water quality during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Hydrological regime: river flow | Maintain appropriate hydrological regimes | There will be no change to the hydrological regime of this habitat within the SAC.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures has been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any |
| Hydrological regime: groundwater discharge | Maintain appropriate hydrological regime | |

| Attribute | Target | Assessment |
|---|---|---|
| | | deterioration of water quality during any phase of the proposed development. |
| Substratum composition: particle size range | Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes | There will be no change to the substratum composition or water quality of this habitat within the SAC.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures has been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |
| Water quality | Maintain appropriate water quality to support the natural structure and functioning of the habitat | |
| Typical species | Typical species of the relevant habitat sub-types should be present and in good condition | There will be no change to the typical species composition of this habitat within the SAC.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures has been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any deterioration of water quality during any phase of the proposed development. |
| Floodplain connectivity: area | The area of active floodplain at, and upstream of, the habitat, necessary to support all sub-types of the habitat should be maintained | There will be no change to area of floodplain connectivity within the SAC.<br><br>The Proposed Development has been specifically designed to avoid impacts on watercourses within and surrounding the site.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures has been incorporated into the Proposed Development for the protection of water quality. No instream works are proposed and measures are in place to avoid any habitat degradation or deterioration of water quality during any phase of the proposed development. |

| Attribute | Target | Assessment |
|---|---|---|
| Fringing habitats: area and condition | Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types | There will be no change to the area or condition of fringing habitats associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.5.5 Northern Atlantic wet heaths with *Erica tetralix* [4010]

*Table 6-20 Targets and Attributes associated with nominated site-specific conservation objectives for northern Atlantic wet heaths with Erica tetralix [4010]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been |
| Vegetation composition: cross-leaved heath | Cross-leaved heath (*Erica tetralix*) present within a 20m | |

| Attribute | Target | Assessment |
|---|---|---|
| | radius of each monitoring stop | incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Cover of positive indicator species at least 50% | |
| Vegetation composition: lichens and bryophytes | Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10% | |
| Vegetation composition: ericoid species and crowberry | Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15% | |
| Vegetation composition: dwarf shrub species | Cover of dwarf shrubs less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 20% | |
| Vegetation composition: bracken | Cover of bracken (*Pteridium aquilinum*) less than 10% | |
| Vegetation composition: soft rush | Cover of soft rush (*Juncus effusus*) less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur as a result of the proposed development. |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.5.6 Alpine and Boreal heaths [4060]

*Table 6-21 Targets and Attributes associated with nominated site-specific conservation objectives for Alpine and Boreal heaths [4060]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |

| Attribute | Target | Assessment |
|---|---|---|
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: lichens and bryophytes | Number of bryophyte or non-crustose lichen species present at each monitoring step is at least three | |
| Vegetation composition: positive indicator species | Cover of positive indicator species at least 66% | |
| Vegetation composition: dwarf shrub species | Cover of dwarf shrubs species is at least 10% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 10% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation structure: signs of browsing | Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing | |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |

| Attribute | Target | Assessment |
|---|---|---|
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | |

## 6.5.7 *Juniperus communis* formations on heaths or calcareous grasslands [5130]

*Table 6-22 Targets and Attributes associated with nominated site-specific conservation objectives for* Juniperus communis formations on heaths or calcareous grasslands *[*5130*]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Juniper population size | At least 50 plants per formation | There will be no decline in the number of juniper plants within this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: typical species | At least 50% of the listed positive indicator species for the relevant vegetation group present | There will be no composition or structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: cone-bearing plants | At least 10% of juniper plants are bearing cones | during any phase of the proposed development. |
| Vegetation structure: seedling recruitment | At least 10% of juniper plants are seedlings | |
| Vegetation structure: dead juniper | Mean percentage of each juniper plant dead less than 10% | |

## 6.5.8 Blanket bogs (*if active bog) [7130]

*Table 6-23 Extrapolated Targets and Attributes associated with site specific conservation objectives for blanket bogs [7130]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the ecosystem function of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Ecosystem function: peat formation | At least 99% of the total Annex I blanket bog area is active | |
| Ecosystem function: hydrology | Natural hydrology unaffected by drains and erosion | |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: positive indicator species | Number of positive indicator species present at each monitoring stop is at least seven | |
| Vegetation composition: lichens and bryophytes | Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10% | |

| Attribute | Target | Assessment |
|---|---|---|
| Vegetation composition: potential dominant species | Cover of each of the potential dominant species less than 75% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation composition: native trees and shrubs | Cover of scattered native trees and shrubs less than 10% | |
| Vegetation composition: *Sphagnum* condition | Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up | |
| Vegetation structure: signs of browsing | Last complete growing season's shoots of ericoids (*Empetrum nigrum*) and bog myrtle (*Myrica gale*) showing signs of browsing collectively less than 33% | There are no pathways arising from the Proposed Development that would allow changes to the vegetation structure to occur. |
| Vegetation structure: burning | No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Physical structure: erosion | Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC. |

| Attribute | Target | Assessment |
|---|---|---|
| | | As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

## 6.5.9 Transition mires and quaking bogs [7140]

*Table 6-24 Extrapolated Targets and Attributes associated with site specific conservation objectives for transition mires and quaking bogs [7140]*

| Attribute | Target | Assessment |
|---|---|---|
| Habitat area | Area stable or increasing, subject to natural processes | There will be no decline in the habitat area or habitat distribution of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Habitat distribution | No decline, subject to natural processes | |
| Ecosystem function: soil nutrients | Maintain soil nutrient status within natural range | There will be no change to the soil nutrient status of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Community diversity | Maintain variety of vegetation communities, subject to natural processes | There will be no change to the vegetation diversity and composition of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Vegetation composition: number of positive indicator species | Number of positive indicator species present at each monitoring stop is at least three for infilling pools and flushes and at least six for fens | |
| Vegetation composition: | At least one core positive indicator species present | |

| Attribute | Target | Assessment |
|---|---|---|
| number of core positive indicator species | | |
| Vegetation composition: cover of positive indicator species | Total cover of positive indicator species is at least 25% | |
| Vegetation composition: negative indicator species | Total cover of negative indicator species less than 1% | |
| Vegetation composition: non-native species | Cover of non-native species less than 1% | |
| Vegetation structure: height | Proportion of live leaves and/or flowering shoots of vascular plants that are more than 15cm above the ground surface should be at least 50% | |
| Physical structure: disturbed bare ground | Cover of disturbed area less than 10% | There will be no change to the physical structure of this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Physical structure: drainage | Area showing signs of drainage from heavy trampling, tracking or ditches less than 10% | |
| Indicators of local distinctiveness | No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat | There will be no decline in rare, threatened or scarce species associated with this habitat within the SAC.<br><br>As described in Section 5.4 of this NIS, Section 4.7 of the EIAR and the detailed CEMP, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |

### 6.5.10 Determination on Potential Adverse Effects on Owenduff/Nephin Complex SAC

Based on the above review of the individual QIs and following implementation of best practice and mitigation measures described in Sections 5.4 of this report, Section 4.7 of the EIAR and the detailed CEMP, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SAC.

## 6.6 Owenduff/Nephin Complex SPA [004098]

No detailed Conservation Objectives are available for Owenduff/Nephin Complex SPA or any other SPA which has the same SCIs. In the absence of SSCOs, the attributes and targets for breeding species were taken from the SSCOs for River Shannon and River Fergus Estuaries SPA (NPWS 2012).

*Table 6-25 Extrapolated Targets and Attributes associated with site specific conservation objectives for breeding SCI species*

| Attribute | Target | Assessment |
|---|---|---|
| Breeding population abundance: apparently occupied nests (AONs) | No significant decline | There will be no decline in breeding population abundance, productivity rate or number of breeding colonies of Merlin or Golden Plover.<br><br>As described in Section 5.4.3 of this NIS and appendix 7-1 of the EIAR, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or disturbance during any phase of the proposed development. |
| Productivity rate | No significant decline | |
| Distribution: breeding colonies | No significant decline | |
| Prey biomass available | No significant decline | There will be no decline in available prey biomass for Merlin or Golden Plover.<br><br>As described Section 5.4.3 of this NIS and appendix 7-1 of the EIAR, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation during any phase of the proposed development. |
| Barriers to connectivity | No significant increase | The Proposed Development will not result in any significant increase of barriers to connectivity. Any roads associated with the Proposed Development are pre-existing and the footprint of the turbines is comparably small and located entirely within a conifer plantation. |
| Disturbance at the breeding site | Human activities should occur at levels that do not | There will be no disturbance to breeding sites as a result of human activities. |

| | | |
|---|---|---|
| | adversely affect the breeding population | As described in Section 5.4.3 of this NIS and appendix 7-1 of the EIAR, a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of disturbance during any phase of the proposed development. |
| Population trend | Long term population stable or increasing | There will be no changes to the population trend or distribution of Merlin or Golden Plover.<br><br>As described Section 5.4.3 of this NIS and appendix 7-1 of the EIAR a suite of best practice environmental control and mitigation measures have been incorporated into the Proposed Development to avoid any effects of habitat degradation or disturbance during any phase of the proposed development. |
| Distribution | There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation | |

### 6.6.1 Determination of Potential Adverse Effects on Owenduff/Nephin Complex SPA

Based on the above review of the individual SCIs and following implementation of best practice and mitigation measures described in Sections 5.4.3 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the proposed works will not adversely affect this SPA.

## 6.7 Conclusion of Residual Impact Assessment

In view of best scientific knowledge, on the basis of objective information, and taking into account all necessary mitigation incorporated into the proposed development, there is no potential for adverse effect on the identified QIs/SCIs and their associated targets and attributes, or on any European Site. All pathways for effect have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the project design.

It will not prevent the QIs/SCIs of any European Sites from achieving favourable conservation status in the future as defined in Article 1 of the EU Habitats Directive. A definition of Favourable Conservation Status is provided below:

> *'conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2;*

*The conservation status will be taken as 'favourable' when:*

- *Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.'*

Based on the above, it can be concluded in view of best scientific knowledge, on the basis of objective information that the Proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Designated Sites including the following:

- Carrowmore Lake Complex SAC [000476]
- Slieve Fyagh Bog SAC [000542]
- Glenamoy Bog Complex SAC [000500]
- Bellacorick Bog Complex SAC [001922]
- Owenduff/Nephin Complex SAC [000534]
- Owenduff/Nephin Complex SPA [004098]

# 7. IN-COMBINATION EFFECTS

A search and review in relation to plans and projects that may have the potential to result in cumulative and/or in-combination impacts on European Sites was conducted on the 16th of March 2022. This included a review of online Planning Registers, development plans and other available information and served to identify past and future plans and projects, their activities and their predicted environmental effects.

## 7.1 Development context – Ecological Plans and Policies

The following development plans been reviewed and taken into consideration as part of this assessment:

- Mayo County Development Plan 2022 – 2028
- National Biodiversity Action Plan 2017-2021
- The Regional Planning Guidelines for the West 2010-2022

The review focused on policies and objectives that relate to Natura 2000 sites and natural heritage. Policies and objectives relating to sustainable land use were also reviewed.

## 7.2 Plans

*Table 7-1Review of plans*

| Plans | Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence | Assessment of development compliance with policy |
|---|---|---|
| **Mayo County Development Plan 2022-2028** | **Peatlands**<br><br>**Objective 15:** As part of the implementation of Climate Ready Mayo, Climate Adaption Strategy, to develop and implement a Peatland Management Strategy for County Mayo that will: (a) Identify damaged Peatlands in the county and those at risk from climate change and becoming carbon emitters. (b) Initiate conservation and management of Mayo's peatlands, particularly those sites nominated for designation as Special Areas of Conservation and Natural Heritage Areas, to preserve the habitat and their unique ecosystems, managing flood risk and other environmental benefits.<br><br>**Objective 16:** To actively increase public awareness of the importance of peatlands as carbon sinks to combat climate change.<br><br>**Biodiversity, Designated and Non-Designated Sites**<br><br>**Objective 1:** To support the protection, conservation and enhancement of the natural heritage of County Mayo, including the protection of the integrity of European sites, that form part of the Natura 2000 network, the protection of Natural Heritage Areas, proposed Natural Heritage Areas Ramsar Sites, Nature Reserves and Wild Fowl Sanctuaries (and other designated sites including any future designations)<br><br>**Objective 4:** To protect and enhance biodiversity and ecological connectivity in County Mayo, including woodlands, trees, hedgerows, semi-natural grasslands, rivers, streams, natural springs, wetlands, stonewalls, geological and geo-morphological systems, other landscape features and associated wildlife, where these form part of the ecological network.<br><br>**Objective 6:** To protect surface waters, aquatic and wetland habitats and freshwater and water dependent species through the implementation of all appropriate and relevant Directives and | The Development Plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites.<br><br>The Proposed Development has been designed in order to avoid peatland habitats and the Biodiversity Management Plan includes for the improvement of existing and the creation of new peatland habitat.<br><br>The Proposed Development is located outside of any Designated sites, as described in Section 5.<br><br>No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified.<br><br>No developments or projects identified within the Development Plan were found to occur within 20km of the Proposed Development. |

| Plans | Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence | Assessment of development compliance with policy |
|---|---|---|
| | transposed legislation and seek to protect and conserve the quality, character and features of inland waterways by controlling developments close to navigable and non-navigable waterways.<br><br>**Objective 8:** To maintain, protect and where possible enhance bogs, fens and turloughs, where appropriate, in County Mayo.<br><br>**Objective 11**: To ensure that the impact of development within or adjacent to national designated sites, Natural Heritage Areas, Ramsar Sites and Nature Reserves likely to result in significant adverse effects on the designated site is assessed by requiring the submission of an Ecological Impact Assessment prepared by a suitably qualified professional, which should accompany planning applications. | |
| **National Biodiversity Action Plan 2017-2021** | **Objective 4: Conserve and restore biodiversity and ecosystem services in the wider countryside**<br>• Action 4.2.1. Continue to protect, enhance and monitor the ecological status of water during the second cycle of the Water Framework Directive (2015- 2021) including reducing risks to water quality and utilising ecological expertise in decision-making, and in analysis of cumulative effects<br><br>**Objective 6: Expand and improve management of protected areas and species**<br><br>Target 6.2: Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020. | The National Biodiversity Action Plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites.<br><br>There will be no deterioration of water quality as a result of the proposed development.<br><br>The Proposed Development has been designed in order to avoid any potential fragmentation of habitats or commuting corridors.<br><br>No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified. |
| **The Regional Planning Guidelines for the West 2010-2022** | **EAP13:** To support the protection of Natural Heritage Areas, Special Protection Areas, Special Areas of Conservation, Nature Reserves, Ramsar Sites (Wetlands), Wildfowl Sanctuaries, National Parks, Nature Reserves and the biodiversity designated under the Habitats Directive, Birds Directive, Wildlife Act, Flora Protection Order and other designated or future designated sites. | The Proposed Development will not result in significant effects on habitat and features of ecological importance. The Proposed Development has been designed to avoid and minimise impacts on sensitive habitats and species. |

| Plans | Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence | Assessment of development compliance with policy |
|---|---|---|
| | **EAO18:** Support the achievement of favourable conservation status of Annex I habitats, Annex II species, Annex I bird species and other regularly occurring migratory bird species and their habitats in the region. | No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified |

## 7.3 Other Projects

Assessment material for this in-combination impact assessment was compiled on the relevant developments within the vicinity of the Proposed Development and was verified on the 21/03/2022. The material was gathered through a search of relevant online Planning Registers, reviews of relevant documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts. All relevant projects were considered in relation to the potential for in-combination effects. All relevant data was reviewed (e.g. individual EISs/EIARs, layouts, drawings etc.) for all relevant projects. These are listed below.

**Other Developments**
The review of planning register for Mayo County Council documented relevant general development planning applications in the vicinity of Proposed Development site and the grid connection route, most of which relate to the provision and/or alteration of one-off rural housing and agriculture-related structures.

**Consideration of Forestry Replacement Lands**

The replacement of forestry, felled as part of the proposed development, may occur on any lands, within the state, benefitting from Forest Service Technical Approval for afforestation, should the Proposed Development receive planning permission. Under the Forestry Regulations 2017, all applications for licences for afforestation require the prior written approval (technical approval) of the Minister for Agriculture, Food and the Marine.

The requirements for afforestation licencing are set out in the Forestry Regulations 2017 – this includes consideration of Environmental Impact Assessment and Appropriate Assessment as set out in parts 7 and 8 of the Regulations, respectively. Further detail is set out in the Environmental Requirements for Afforestation (DAFM, 2016). This ensures that afforestation takes place in a way that complies with environmental legislation and enhances the contribution new woodlands and forests can make to the environment and to the provision of ecosystem services, such as water protection and landscape enhancement.

The typical environmental effects of afforestation include potential effects on biodiversity, soils and geology, hydrology and hydrogeology, cultural heritage, landscape and visual, and air and climate.

The applicant is seeking a ten-year planning permission which incorporates time to secure a grid connection agreement, a route to market (RESS or equivalent Power Purchase Agreement), select the preferred equipment suppliers and put the necessary capital funding in place to allow construction and delivery to commence. Thus, the identification of forestry replacement lands at this stage is seen as premature. If a licence for afforestation was obtained prior to seeking and/or obtaining planning permission, it is highly likely that any licencing approvals sought from the Forest Service would have expired before it could be taken up due to the time required for the planning processes and post-planning delivery preparations. The Forest Service Afforestation Licences expire after 3 years from when they are consented.

Furthermore, as mentioned above, the key environmental issues relating to afforestation include water, biodiversity, archaeology, and landscape. Each is subject to regular updates in terms of best practice, guidelines, standards and national policies. Delaying the identification of alternative afforestation lands until such time as they are required enables identification of optimum lands available (from an environmental perspective) for afforestation at that time.

For the purposes of this project, the applicant commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity (i.e. outside the catchment within which the proposed project is located) with the proposed project. On this basis, it is reasonable to conclude that there will be no more than imperceptible in-combination cumulative effects associated with the replanting. Therefore, forestry replanting is not considered further in the impact assessment chapters of this EIAR.

In addition, the applicant commits to not commencing the project until both a felling and afforestation licence(s) is in place and, therefore, this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority.

Further details in relation to the consideration of forestry replanting is included in Section 4.3.10.1 of this EIAR.

As the Proposed Development will result in the felling of existing forestry lands within the Proposed Development footprint, additional lands have been identified for forestry replacement of this area. This afforestation has been subject to its own separate consenting process and all necessary Appropriate Assessment and Screening requirements associated.

**Forestry Practices**

The majority of the lands within the site and the surrounding area are planted with commercial forestry. The management and felling of this surrounding commercial forestry was also considered in this assessment.

**Other Wind Turbines**

There are a number of permitted and operation windfarm developments permitted within a 20-kilometre radius of the Proposed Development site, which are detailed in Table 7.2.

## 7.3.1 Projects considered in the Cumulative Impact Assessment

A review of the Planning Register for Mayo County Council shows that there has been a number of renewable energy and energy infrastructure planning applications within the vicinity of the application site.

Table 7-2 sets out the planning applications identified in relation to wind energy (and associated works) within approximately 20 kilometres of the Proposed Development site:

*Table 7-2 Applications Within 5km of the Proposed Wind Farm*

| Pl. Ref | Description | Decision |
|---|---|---|
| **Sheskin Wind Farm (ABO Wind Ireland Ltd.)** | | |
| 15825 | 8 Wind turbines with associated hardstanding, construction of new internal access tracks, upgrading existing access tracks, underground cabling, permanent meteorological mast and associated hardstanding, electrical substation, recreational walking trail, site compound and associated works, each wind turbine will have an overall max height of 150 metres, comprising a tower 95-105m high, to which three blades of 45-55 m length will be attached | Granted by MCC 07/12/2016 subject to 46 conditions |
| 19457 | Amendments to existing planning permission p15/825 for 8 turbines with an overall max height of 150m, amendments to include - an increase in the overall maximum height of the turbines from 150m to 176m (turbines 1-3) and from 150m to 165m (turbines 4-8) comprising a tower 95-120m high to which three blades of 55-70m length will be attached. an increase in the maximum height of the permanent met mast from 100m to 120m. an increase in the | Granted by MCC 06/11/2019 subject to 52 conditions |

| | | |
|---|---|---|
| | diameter of the foundation base from 22m to 26m. an amendment to condition no 46 to revise the community benefit payment to 2 euro//mwh to be consistent with government guidance set out under the renewable electricity support scheme. the red line boundary and all other aspects of the permitted development will remain unchanged | |
| **Sheskin Wind Farm Grid Connection** | | |
| 20834 (ABP 311157) | 10-year permission to develop an electricity service, entailing the laying of approximately 10.4 kilometres of 38kv underground cable from the granted Sheskin wind farm to connect the wind farm to the national grid at the existing Bellacorick 110kv ESB station. the proposed grid connection will be installed along existing private tracks, the public roadway and a short section of private agricultural land | Refused by MCC on 19/07/2021<br><br>Granted by ABP 31/08/2022 |
| **Oweninny Wind Farm** | | |
| ABP: PA0029 | Proposed Oweninny Wind Farm and associated works, Bellacorick, | Granted by ABP 02/06/2016 subject to 20 conditions |
| ABP: 307261 | Section 146B Planning application for amendments to ABP case reference PA0029 for Oweninny Wind Farm | Alter decision - Not a material Alteration (No EIS) (27/07/2020) |
| ABP: 309375 | Pre-App Consultation - Oweninny Wind Farm Phase 3. Between 10 and 20 wind turbines (including tower sections, nacelle, hub, rotor blades) with an approximate capacity of 90 MW and a maximum blade tip height of 200 metres. | Determined it is an SID – 04/04/2022 |
| **Killala Community Wind Farm** | | |
| 17619 | 10 Year planning permission for 5 turbine wind farm. Proposed Development will be located in the townlands of Magherabrack, Mullafarry, Tawnaghmore Lower, Meelick and Tawnaghmore Upper, Killala approx. 1.3km south of Killala. development is an updated application to the consented 6 turbine wind farm p09/780. proposal is for a wind energy development comprising 5 electricity generating wind turbines, each with a rotor diameter not exceeding 103.2m a hub height not exceeding 73.5m and a blade tip height of not exceeding 126m. the development will include a meteorological mast not exceed 82m in height, internal underground electrical cabling, a substation building, an external underground grid connection cable and ducting to the existing 110kv Tawnaghmore substation, associated grid substation works, associated site access roads and ancillary site works including upgrades to existing site access, a temporary construction compound and haulage route works. the max output capacity of the wind farm will be up to 18mw and has an intended operation life of 25 years | Granted by MCC 15/02/2018 subject to 19 conditions |
| 19260 | 25 Year permission for a single electricity generating wind turbine with an overall maximum height of up to 125m. The development will also consist of a turbine hardstand, access track of c.394m, internal cable trench of c.1,775m and ancillary site works. The planning application is accompanied by a Natura Impact Statement | Granted by MCC 15/10/2019 subject to 12 conditions |
| **Dooleg More Single Turbine** | | |

| | | |
|---|---|---|
| 20467 | Single wind turbine generator and 20kV grid connection to Bellacorick 110kV substation | Granted by MCC 25/03/2021 subject to 15 conditions |
| **Bunnahowen Wind Farm** | | |
| 18873 | Permission to modify the existing permission, p08/1997, to erect three (3) 1mw turbines, control house and ancillary associated works | Granted by MCC 10/03/2019 subject to 6 conditions |
| **Kilsallagh Wind Farm** | | |
| ABP: 312282 | Proposed Kilsallagh Wind Farm consisting of 13 wind turbines and ancillary equipment including 110kV substation infrastructure. | Pre-App consultation request lodged 21/12/2021 |
| **Corvoderry Wind Farm** | | |
| 11838 | Erect an electricity generating wind farm consisting of 10 wind turbines each with an overall height of up to 100 metres, hardstandings, an electrical compound and substation building, 4 car park spaces, associated site roads, drainage and site works | Granted by MCC 10/09/2012 subject to 42 conditions. The permission expired on 14/10/2022 |

Where the potential for the Proposed Development to result in adverse effects on European Sites on its own was identified, there was potential for it to contribute to in combination effects when considered in combination with other plans and projects. Following the implementation of the best practice measures outlined in Sections 3 and 5 of this report, in the 'Water' Chapter of the EIAR accompanying this application (Appendix 3) and in the CEMP (Appendix 2), all potential impact pathways have been blocked. There is therefore no potential for the Proposed Development to contribute to any in-combination impact on EU Designated Sites when considered in combination with other plans and projects.

### 7.3.2 Conclusion of Cumulative Assessment

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was there any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the proposed development.

# 8. CONCLUDING STATEMENT

For the reasons set out in detail in this NIS, in the light of the best scientific knowledge in the field, all aspects of the Proposed Development which, by itself, or in combination with other plans or projects, which may affect the relevant European Sites have been considered. The NIS contains information which the competent authority, may consider in making its own complete, precise and definitive findings and conclusions and upon which it is capable of determining that all reasonable scientific doubt has been removed as to the effects of the Proposed Development on the integrity of the relevant Natura 2000 sites.

In conclusion, in light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, the competent authority is enabled to ascertain that the Proposed Development will not adversely affect the integrity of any of the European sites concerned.

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# APPENDIX 1

## APPROPRIATE ASSESSMENT SCREENING REPORT

Planning and Environmental Consultants

# Article 6 (3) Appropriate Assessment Screening Report

## Sheskin South Wind Farm, County Mayo

# DOCUMENT DETAILS

| | |
|---|---|
| Client: | **SSE Renewables (Ireland) Limited** |
| Project Title: | **Sheskin South Wind Farm, County Mayo** |
| Project Number: | **201119** |
| Document Title: | **Article 6 (3) Appropriate Assessment Screening Report** |
| Document File Name: | **AASR F – 2023.02.27 – 201119** |
| Prepared By: | **MKO<br>Tuam Road<br>Galway<br>Ireland<br>H91 VW84** |

Planning and Environmental Consultants

| Rev | Status | Date | Author(s) | Approved By |
|---|---|---|---|---|
| 01 | Draft | 27/10/2022 | IR/CM | PR |
| 02 | Final | 27/02/2023 | IR/CM | PR |
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# 1. INTRODUCTION

## 1.1 Background

MKO has been appointed by the applicant to provide the information necessary to allow the competent authority to conduct an Article 6(3) Screening for Appropriate Assessment of the Proposed Development (as set out in section 2.2.1).

The requirements for "Appropriate Assessment" (AA) are set out in Article 6 of Council Directive 92 /43 /EEC of 21 May 1992, as amended, on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). According to the Habitats Directive, an AA is required of the implications for the European site concerned of any plan or project not directly connected with or necessary to the management of that site but likely to have a significant effect thereon, either individually or in combination with any other plans or projects prior to its approval, and to take into account the cumulative effects which result from the combination of that plan or project with other plans or projects (in-combination effects) in view of the European site's conservation objectives. European Sites include Special Areas of Conservation (SAC) designated under the Habitats Directive, Special Protection Areas (SPA) designated under Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive) and candidate SACs (cSACs) or proposed SPAs (pSPAs), all of which are afforded the same level of protection as fully adopted sites.

The purpose of the screening stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in-combination with other plans or projects, could have significant effects on a Natura 2000 site in view of the site's conservation objectives. There is no necessity to establish such an effect; it is merely necessary for the competent authority to determine that there may be such an effect. The need to apply the precautionary principle in making any key decisions in relation to the tests of AA has been confirmed by the case law of the Court of Justice of the European Union (CJEU). Plans or projects that have no appreciable effect on a European site may be excluded.

The current project is not directly connected with, or necessary for, the management of any European Site consequently the project has been subject to the Appropriate Assessment Screening process.

The assessment in this report is based on a desk study and field surveys undertaken between 2021 and 2023. It specifically assesses the potential for the proposed development to result in significant effects on European sites in the absence of any best practice, mitigation or preventative measures.

This Appropriate Assessment Screening Report has been prepared in accordance with the European Commission's *Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC* (EC, 2021) and *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018) as well as the Department of the Environment's A*ppropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (DoEHLG, 2010) and the Office of the Planning Regulator's *Appropriate Assessment Screening for Development Management* (OPR 2021).

In addition to the guidelines referenced above, the following relevant documents were also applied in the preparation of this report:

1. *Council of the European Commission (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. Series L 20, pp. 7-49.*
2. *EC (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg.*

3. *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence. Opinion of the commission.*
4. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*
5. *EC (2020) Guidance document on wind energy developments and EU nature legislation*

# 1.2 Appropriate Assessment

## 1.2.1 Screening for Appropriate Assessment

Screening is the process of determining whether an Appropriate Assessment is required for a plan or project. Under Part XAB of the Planning and Development Act, 2000, as amended, screening must be carried out by the Competent Authority (which is An Bord Pleanála for the Proposed Development). As per Section 177U of the Planning and Development Act, 2000, as amended 'A screening for appropriate assessment shall be carried out by the competent authority to assess, in view of best scientific knowledge, if that Land use plan or proposed development, individually or in combination with another plan or project is likely to have a significant effect on the European site'. The competent authority shall determine that an appropriate assessment of a draft Land use plan or a proposed development, as the case may be, is required if it cannot be excluded, on the basis of objective information, that the draft Land use plan or proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site The Competent Authority's determination as to whether an Appropriate Assessment is required must be made on the basis of objective information, and in view of best scientific knowledge, and should be recorded. The Competent Authority may request information to be supplied to enable it to carry out screening.

Plans or projects that have no appreciable effect on a European site may be excluded. The threshold at this stage is a very low one and operates as a trigger in order to determine whether an Appropriate Assessment (AA) must be undertaken by the competent authority on the implications of the project for the conservation objectives of a European site. Therefore, where significant effects are likely, uncertain or unknown at screening, an AA will be required. Screening determines whether AA is necessary by examining:

a. Whether a plan or project can be excluded from AA requirements because it is directly connected with or necessary to the management of the European site; and

b. The possible significant effects of a project or plan, either alone or in-combination with other projects or plans, on a European site in view of its conservation objectives, and considering whether these effects will be significant.

The need for Stage Two AA arises where the first stage (or screening process) has either determined (or it was at least implicitly accepted) that the project, alone or in-combination with other plans or projects, is likely to have a significant effect on a European site. Thus, a Stage Two AA is a focused and detailed examination, analysis and evaluation carried out by the competent authority of the implications of the plan or project, alone and in-combination with other plans and projects, on the integrity of a European site in view of that site's conservation objectives.

The term Natura Impact Statement (NIS) is defined in legislation. An NIS, where required, should present the data, information and analysis necessary to the competent authority to reach a definitive determination as to 1) the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and 2) whether there will be adverse effects on the integrity of a European site. The NIS should be a scientific examination of evidence and data, underpinned by best scientific knowledge, objective information and by the precautionary principle.

This Article 6(3) Appropriate Assessment Screening Report has been prepared in compliance with the provisions of section 177U of the Planning & Development Act 2010 as amended.

### 1.2.2 Statement of Authority

The baseline ecological survey was by Inga Reich (Honours degree Biology, Ph.D. Applied Ecology) and Kevin Mc Elduff (B.Sc. Environmental Science). The report was written by Inga Reich and Colin Murphy (B.Sc, M.Sc) and has been reviewed by Pat Roberts (B.Sc. Environmental Science, MCIEEM). Pat has over 15 years' post graduate experience in ecological consultancy and impact assessment.

### 1.2.3 Data Collected to Carry Out Assessment

In preparation of the report, the following sources were used to gather information:

- Review of NPWS Site Synopses, Conservation Objectives for the European sites
- Review of 2019, 2013 and 2007 EU Habitats Directive (Article 17[1]) Reports and EU Birds Directive (Article 12[2]) Reports.
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA, Water Framework Directive (WFD),
- Review of specially requested records from the NPWS Rare and Protected Species Database for the hectads which overlap with the study area.
- Review of OS maps and aerial photographs of the site of the proposed project.
- Review of relevant databases including National Biodiversity Ireland Database and available literature of previous surveys conducted in the area.
- Review of other plans and projects within the area.
- MKO field assessment surveys carried out between 2021 and 2022 and as provided in full in the EIAR and NIS.
- Bird surveys carried out by Malachy Walsh and Partners between 2019-2022 (Bird survey effort is fully described in appendix 7-1 of the EIAR) accompanying this application).

[1] *NPWS, 2020, The status and trends of Ireland's bird species – Article 12 Reports, Online, Available at: https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting Accessed 31.01.2021*
[2] *NPWS, 2020, The status and trends of Ireland's bird species – Article 12 Reports, Online, Available at: https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting Accessed 31.01.2021*

# 2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

## 2.1 Site Location

The proposed development site is located in Sheskin, North County Mayo, the Grid Reference coordinates for the approximate centre of the site are E 094163 N 326671.

It is approximately 2.6 kilometres north of Ballymonally, 7km north-east of Bangor Erris and 11 km south of the Atlantic (Figure 2.1). Ballycroy National Park is located about 7km to the south while Knockmoyle Sheskin Nature Reserve is 2.1km to the east. Elevation ranges between 110m above ordnance datum (AOD) in the southeast to 285m AOD in the west.

The site of the proposed development is located about 3km north of the N59 and is currently accessed via a local road (part of the Western Way), which runs to the east of the site as well as existing forestry tracks.

## 2.2 Characteristics of the Proposed Development

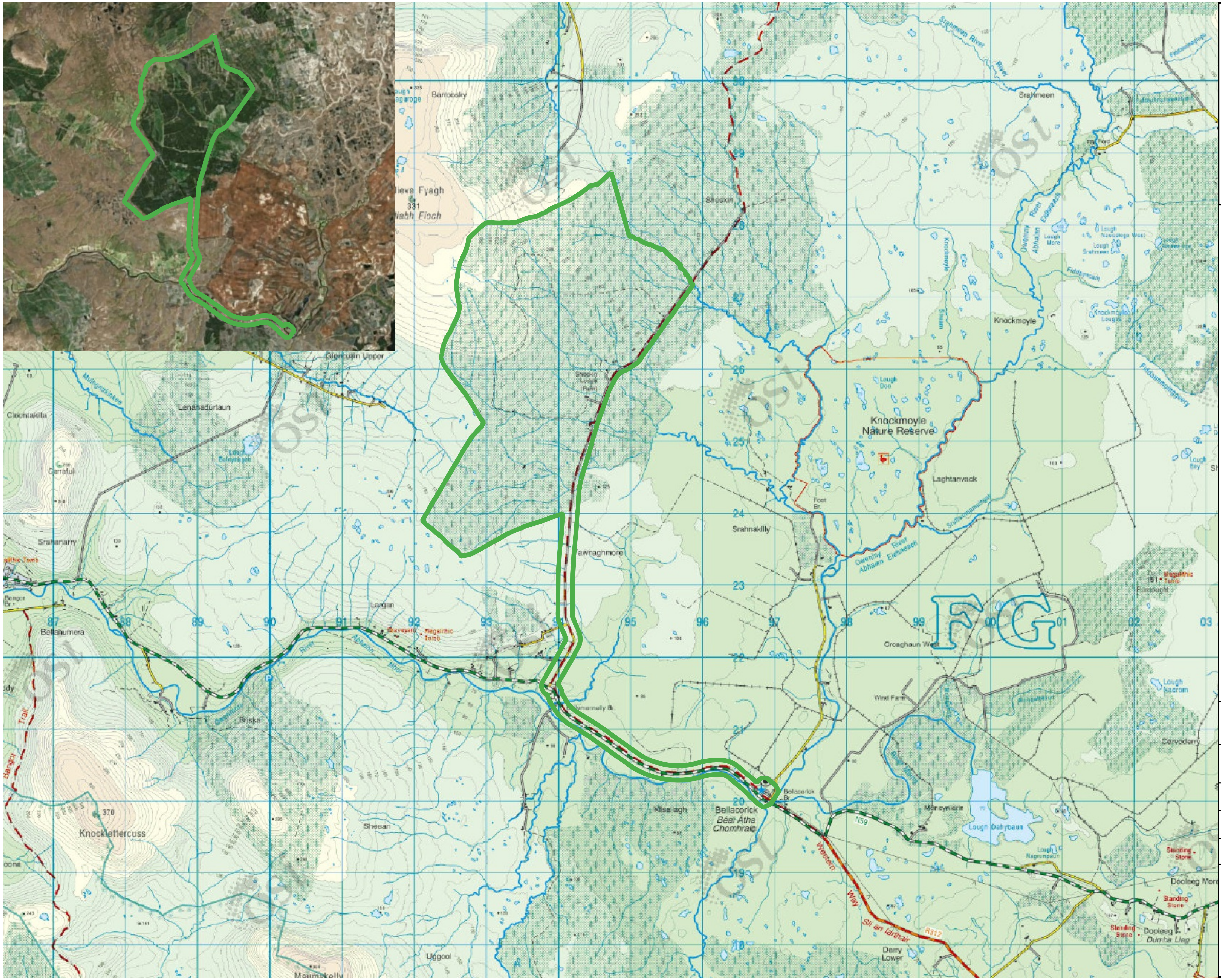
### 2.2.1 Description of the project

This section of the Appropriate Assessment Screening Report (AASR) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála, ('the Proposed Development'). The Proposed Development comprises:

1. *Construction of 21 no. wind turbines and associated hardstand areas with the following parameters:*
2. *A total tip height of 200 metres,*
3. *Hub height of 115 metres, and*
4. *Rotor diameter of 170 metres*
5. *All associated underground electrical and communications cabling;*
6. *1 no. Meteorological Mast of 115 metres in height;*
7. *Upgrade of existing tracks and roads, provision of new permanent site access roads, upgrade of 2 no. existing site entrances, construction of 1 no. new site entrance;*
8. *2 no. borrow pits;*
9. *11 no. permanent peat placement areas;*
10. *4 no. temporary construction compounds;*
11. *Permanent recreation and amenity works, including marked trails, seating areas, amenity car park, and associated amenity signage;*
12. *Site Drainage;*
13. *Site Signage;*
14. *Ancillary Forestry Felling to facilitate construction and operation of the proposed development;*
15. *All works associated with the habitat enhancement and biodiversity management within the wind farm site; and*
16. *All associated site development works.*

This application is seeking a ten-year permission and 35 year operational life from the date of commissioning of the renewable energy development.

*A full description of the Proposed Development is located in Chapter 4 of the EIAR* and section 3.2 of the NIS. The overall layout of the Proposed Development is shown on Figure 4-1a of Chapter 4 of the EIAR. This drawing shows the proposed locations of the wind turbines, electricity substation, grid connection route, borrow pits, peat and spoil repository, construction compounds, internal roads layout, the turbine delivery route link roads and the main site entrance. Measures intended to avoid or reduce the harmful effects of the proposed development on European sites (i.e. "mitigation measures") or best practice measures have not been taken into account in the screening stage appraisal. A drawing focusing on the core of the development site is shown on Figure 4-1b. Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to the EIAR.




## Map Legend

EIAR Site Boundary

Drawing Title
EIAR Site Boundary

Project Title
Sheskin South Wind Farm

| Drawn By | Checked By |
| --- | --- |
| CM | CM |
| **Project No.** | **Drawing No.** |
| 201119 | Figure 2-1 |
| **Scale** | **Date** |
| 1:68,550 | 27.02.2023 |


MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

## 2.2.2 Baseline Ecological Environment

### 2.2.2.1 Habitat Surveys

Multidisciplinary walkover surveys, in accordance with TII guidelines on *Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes* (TII, 2009), were undertaken within the EIAR Site Boundary on the following dates:

- 4th August 2021
- 10th August 2021
- 18th August 2021
- 2nd September 2021
- 24th September 2021
- 18th January 2022
- 21st January 2022
- 24th November 2022
- 6th December 2022

All surveys of vegetation were completed within the optimum period for vegetation surveys/habitat mapping, i.e. April to September (Smith *et al*., 2011). A comprehensive walkover of the entire EIAR Site Boundary was completed.

The walkover surveys were also designed to detect the presence, or likely presence, of a range of protected species. The survey included a search for badger setts and areas of suitable habitat, potential features likely to be of significance to bats and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the proposed development (e.g. otter etc.). In addition, an inventory of other species of local biodiversity interest was compiled including invertebrates (butterflies, dragonflies, damselflies, beetles), plants, fungi etc.

The multi-disciplinary walkover surveys comprehensively covered the entire EIAR Site Boundary for features and locations of ecological significance. Based on the multi-disciplinary walkover survey findings, further detailed targeted surveys were carried out during follow-up species specific survey visits. These are described in detail below. These surveys were carried out in accordance with TII guidelines on *Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes* (TII, 2009b).

During the multidisciplinary surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted.

The habitats within the study area boundary are dominated by **Conifer plantation (WD4).** This includes forestry (WD4) of various ages (including clear-felled areas, semi-mature and mature stands, along with immature pre-thicket areas of both first and second rotation. Lodgepole pine (*Pinus contorta*) is the dominant species with Sitka spruce (*Picea sitchensis*) only occurring in pockets of the site. The proposed development site is surrounded by **Lowland Blanket Bog (PB3)** to the north, west and south. Within the EIAR Site Boundary, this habitat is confined to the north-western corner of the site, and another small area is found on sloping ground between a watercourse and one of the existing roads. **Three Dystrophic lakes (FL1)** can be found in the south-west of the site. Unbound forestry tracks throughout the site were categorised as **Spoil and bare ground (ED2).** The Sheskin Stream, along with a number of unnamed watercourse occur within the site and are categorized as **Eroding /upland rivers (FW1)** and nearly all of which flow in an easterly direction towards the Owenmore River. **Drainage ditches (FW4)** are frequently present along the existing road and within the conifer plantation.

The proposed grid connection route has an approximate length of 6.5 km. Habitats occurring along and adjacent to this route include: **Spoil and bare ground (ED2), Conifer plantation (WD4), Cutover**

**bog (WD4), Blanket bog (PB3), Agricultural grassland (GA1), Wet grassland (GS4), Scrub (WS1)** and **Buildings and Artificial Surfaces (BL3).** Several watercourses **(FW1)** draining from the site are crossed.

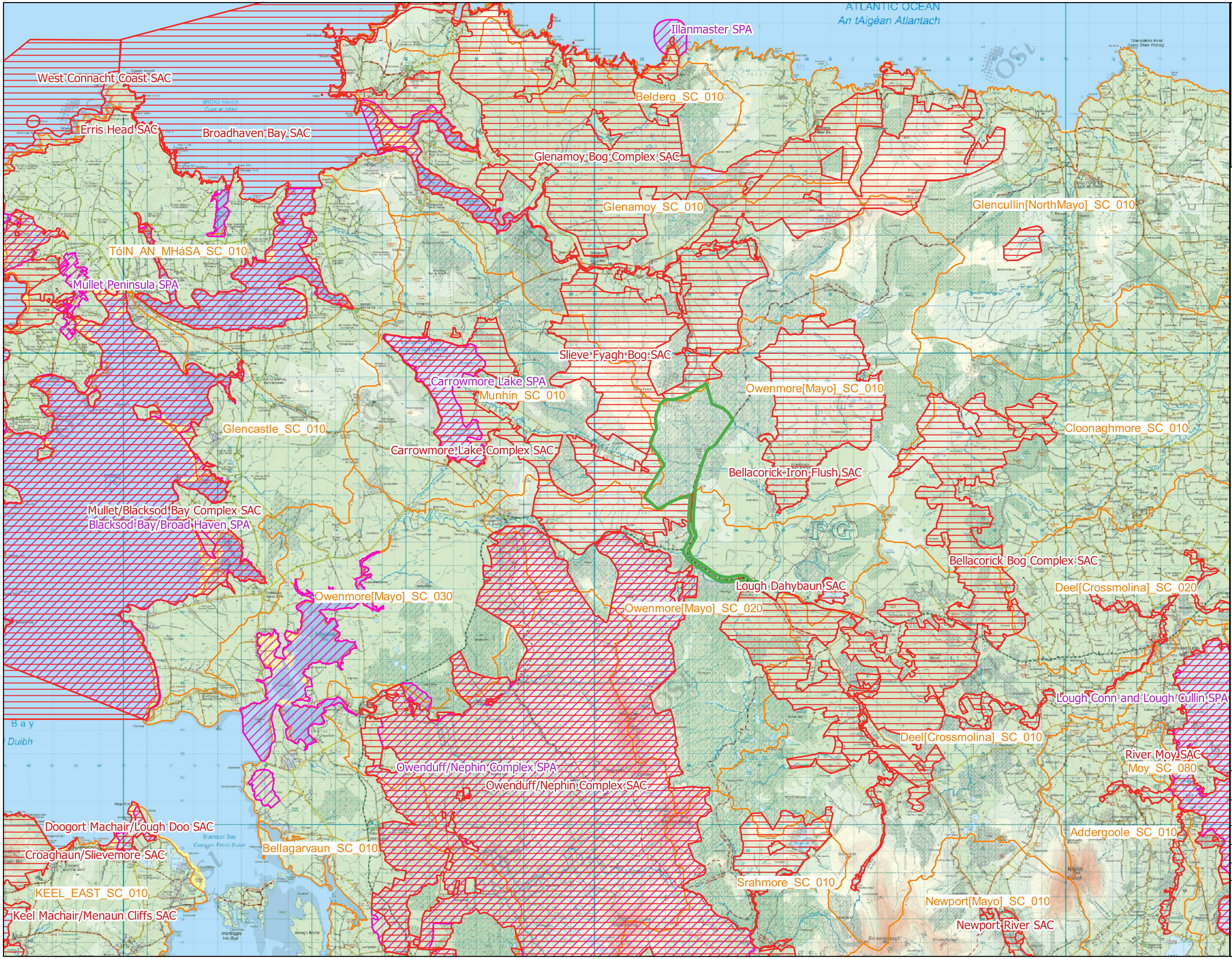
A full description of habitats present within the site of the proposed development is provided in Section 4.4 of the NIS (also see Section 6.6, Chapter 6 of the accompanying EIAR).

# 3. IDENTIFICATION OF RELEVANT EUROPEAN SITES

## 3.1 Identification of the European Sites within the Likely Zone of Impact

The assessment in this report is based on a desk study and field surveys undertaken between 2020 and 2022 The following methodology was used to establish which European Sites are within the Likely Zone of Impact of the proposed development:

- Initially the most up to date GIS spatial datasets for European designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 06/01/2022 and the 13/01/2023. The datasets were utilised to identify European Sites which could feasibly be affected by the proposed development.
- All European Sites that could potentially be affected were identified using a source-pathway – receptor model. To provide context for the assessment, European Sites surrounding the development site are shown on Figure 3.1. Information on these sites according to the site-specific conservation objectives is provided in Table 3-1. Sites that were further away from the proposed development were also considered and no complete source-pathway-receptor chain for significant effect was identified for any other European Site.
- Hydrological catchment mapping was used to establish or discount potential hydrological connectivity between the site of the proposed development and any European Sites. The hydrological catchments are also shown in Figure 3-1.
- In relation to Special Protection Areas, in the absence of any specific European or Irish guidance in relation to such sites, the Scottish Natural Heritage (SNH) Guidance, 'Assessing Connectivity with Special Protection Areas (SPA)' (2016) was consulted. This document provides guidance in relation to the identification of connectivity between proposed development and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.
- Figure 3-1 below provides details of all relevant European Sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. The assessment considers any likely direct or indirect impacts of the proposed development, both alone and in combination with other plans and projects, on European Sites by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of construction, operation and decommissioning were considered in this screening assessment
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report.
- Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and considered in the Screening Assessment




Map Legend

- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- EPA hydrological sub-catchments
- EIAR Site Boundary



| | |
|---|---|
| Drawing Title: European Designated Sites within Zone of Influence | |
| Project Title: Proposed Sheskin South Wind farm | |
| Drawn By: CM | Checked By: CM |
| Project No.: 201119 | Drawing No.: Figure 3-1 |
| Scale: 1:141,100 | Date: 26.02.2023 |

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

*Table 3-1 Designated sites within the Likely Zone of Impact*

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| Special Areas of Conservation (SAC) | | | | |
| Carrowmore Lake Complex SAC [000476]<br><br>**Distance:** 0km | 〉 Blanket bogs (* if active bog) [7130]<br>〉 Depressions on peat substrates of the Rhynchosporion [7150]<br>〉 *Saxifraga hirculus* (Marsh saxifrage) [1528]<br>〉 *Hamatocaulis vernicosus* (Slender green feathermoss) [6216] | Detailed conservation objectives for this site (Version 1, May 2017) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000476.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>While the red line boundary includes a watercourse that flows directly into the SAC, the closest works are 200m away from this stream and there is no surface water linkage. Due to the proximity of the proposed development to the designated site and on a precautionary basis, there is potential for indirect effects on this SAC in the form of | Yes – Potential for significant effect has been identified and there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | habitat degradation arising during the construction, operational and decommissioning phases, e.g. drainage or hydrological changes. In addition, there is potential for pollution with dust arising from works along the proposed grid connection route and as such there is potential of deterioration of QI habitats and supporting habitats for QI species within this SAC during the construction phase.<br><br>**The SAC is considered to be within the Likely Zone of Impact and further assessment is required.** | |
| Slieve Fyagh Bog SAC [000542] | › Blanket bog (* if active bog) [7130] | Detailed conservation objectives for this site (Version 1, August 2016) were | There will be no direct effects as the project | Yes – Potential for significant effect has been identified and |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| **Distance:** 0km | | reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000542.pdf. | footprint is located entirely outside the designated site.<br><br>There is no surface water connection and the closest works are 215m away. Due to the proximity of the proposed development to the designated site and on a precautionary basis, there is potential for indirect effects on this SAC in the form of habitat degradation during the construction, operational and decommissioning phases, e.g. drainage or hydrological changes.<br><br>**The SAC is considered to be within the Likely Zone of Impact and further assessment is required.** | there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| Glenamoy Bog Complex SAC [000500]<br><br>**Distance:** 0km | › Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]<br>› Machairs (* in Ireland) [21A0]<br>› Natural dystrophic lakes and ponds [3160]<br>› Northern Atlantic wet heaths with *Erica tetralix* [4010]<br>› *Juniperus communis* formations on heaths or calcareous grasslands [5130]<br>› Blanket bogs (* if active bog) [7130]<br>› Transition mires and quaking bogs [7140]<br>› Depressions on peat substrates of the Rhynchosporion [7150]<br>› *Salmo salar* (Salmon) [1106]<br>› *Petalophyllum ralfsii* (Petalwort) [1395] | Detailed conservation objectives for this site (Version 1, June 2017) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000500.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>While the red line boundary borders a watercourse that is located within the SAC, the closest proposed works are within a separate catchment over 300m away and no surface water connection exists. However, due to the proximity of the proposed development to the designated site and on a precautionary basis, there is potential for indirect effects on this SAC in the form of habitat degradation during the construction, operational and | Yes – Potential for significant effect has been identified and there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | › *Saxifraga hirculus* (Marsh saxifrage) [1528]<br>› *Hamatocaulis vernicosus* (Slender green feather-moss) [6216] | | decommissioning phases, e.g. drainage and hydrological changes.<br><br>**The SAC is considered to be within the Likely Zone of Impact and further assessment is required.** | |
| Bellacorick Bog Complex SAC [001922]<br><br>**Distance:** 1.4km | › Natural dystrophic lakes and ponds [3160]<br>› Northern Atlantic wet heaths with *Erica tetralix* [4010]<br>› Blanket bogs (* if active bog) [7130]<br>› Depressions on peat substrates of the Rhynchosporion [7150]<br>› Alkaline fens [7230]<br>› *Vertigo geyeri* (Geyer's whorl snail) [1013]<br>› *Saxifraga hirculus* (Marsh saxifrage) [1528] | Detailed conservation objectives for this site (Version 1, October 2017) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001922.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site. All works required for the grid connection route will be carried out on the opposite side of the Owenmore River and there will be no direct effects.<br><br>The proposed grid connection route crosses over two tributaries of the Owenmore River, | Yes – Potential for significant effect has been identified and there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | which flows through the very north of the designated site, but which is not designated as a QI. In addition, due to the proximity of the SAC to the grid connection route, there is potential for water pollution and pollution with dust arising from the proposed works and as such there is potential of deterioration of QI habitats and supporting habitats for QI species within this SAC during the construction phase.<br><br>**The SAC is considered to be within the Likely Zone of Impact and further assessment is required.** | |
| Owenduff/Nephin Complex SAC [000534] | › Oligotrophic waters containing very few | Detailed conservation objectives for this site (Version 1, July 2017) were | There will be no direct effects as the project | Yes – Potential for significant effect has been identified and |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| **Distance:** 0.1km | minerals of sandy plains (Littorelletalia uniflorae) [3110]<br>› Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoteo-Nanojuncetea [3130]<br>› Natural dystrophic lakes and ponds [3160]<br>› Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation [3260]<br>› Northern Atlantic wet heaths with *Erica tetralix* [4010]<br>› Alpine and Boreal heaths [4060]<br>› *Juniperus communis* formations on heaths or calcareous grasslands [5130]<br>› Blanket bogs (* if active bog) [7130] | reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000534.pdf. | footprint is located entirely outside the designated site.<br><br>Downstream surface connectivity (approximately 10km surface water distance) with the SAC has been identified via the watercourses that flow from the development site into the Owenmore River and there is potential for deterioration of water quality during the construction, operational and decommissioning phases. Due to the proximity of the SAC to the grid connection route, there is potential for water pollution and pollution with dust arising from the proposed works and as | there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | - Transition mires and quaking bogs [7140]<br>- *Salmo salar* (Salmon) [1106]<br>- *Lutra lutra* (Otter) [1355]<br>- *Saxifraga hirculus* (Marsh Saxifrage) [1528]<br>- *Hamatocaulis vernicosus* (Slender Green Feather-moss) [6216] | | such there is potential of deterioration of QI habitats and supporting habitats for QI species within this SAC during the construction phase.<br><br>In addition, there is suitable habitat for QI species in other, smaller watercourses within and around the proposed development site and the noise from the construction works along the proposed grid connection route may carry into the SAC. As such there is potential for *in* and *ex situ* disturbance and displacement of QI species during the construction and decommissioning phases. | |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | **The SAC is considered to be within the Likely Zone of Impact and further assessment is required.** | |
| Lough Dahybaun SAC [002177]<br><br>**Distance:** 2.4km | › *Najas flexilis* (Slender naiad) [1833] | Detailed conservation objectives for this site (Version 1, January 2021) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002177.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>There is no downstream surface water connectivity between the proposed development and the Designated Site and no pathway for indirect effects on the QI species was identified. Due to the lack of connectivity and distance between the proposed development and the European Site, no complete impact source- | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | pathway-receptor chain exists.<br><br>**The SAC is not within the Likely Zone of Impact and no further assessment is required.** | |
| Bellacorick Iron Flush SAC [000466]<br><br>**Distance:** 5.1km | › *Saxifraga hirculus* (Marsh saxifrage) [1528] | Detailed conservation objectives for this site (Version 1, November 2019) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000466.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>No pathway for indirect effects on the terrestrial QI species was identified. Due to the lack of connectivity and distance between the proposed development and the European Site, no complete impact source-pathway-receptor chain exists. | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | **The SAC is not within the Likely Zone of Impact and no further assessment is required.** | |
| River Moy SAC [002298]<br><br>**Distance:** 5.6km | 〉 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510]<br>〉 Active raised bogs [7110]<br>〉 Degraded raised bogs still capable of natural regeneration [7120]<br>〉 Depressions on peat substrates of the Rhynchosporion [7150]<br>〉 Alkaline fens [7230]<br>〉 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]<br>〉 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] | Detailed conservation objectives for this site (Version 1, August 2016) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002298.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>There is no surface water connectivity between the proposed development and the Designated Site which is located in a separate catchment and no pathway for indirect effects on any of the QI habitats or species was identified. Due to the lack of connectivity and distance between the proposed development and the European Site, | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | › *Austropotamobius pallipes* (White-clawed crayfish) [1092]<br>› *Petromyzon marinus* (Sea lamprey) [1095]<br>› *Lampetra planeri* (Brook lamprey) [1096]<br>› *Salmo salar* (Salmon) [1106]<br>› *Lutra lutra* (Otter) [1355] | | no complete impact source-pathway-receptor chain exists.<br><br>**The SAC is not within the Likely Zone of Impact and no further assessment is required.** | |
| Broadhaven Bay SAC [000472]<br><br>**Distance:** 13.6km | › Mudflats and sandflats not covered by seawater at low tide [1140]<br>› Large shallow inlets and bays [1160]<br>› Reefs [1170]<br>› Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]<br>› Submerged or partially submerged sea caves [8330] | Detailed conservation objectives for this site (Version 1, February 2014) were reviewed as part of the assessment and are available at https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000472.pdf. | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>There is no direct downstream surface water connectivity between the proposed development and the Designated Site, which is buffered from the closest outlet of the Owenmore River by more than 50km of the Atlantic | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | Ocean. Due to the nature, scale and location of the proposed works along with the buffering properties of the intervening waterbodies, there is no potential for significant effects.<br><br>**There is no potential for significant effect on this SAC and no further assessment is required.** | |
| Special Protection Area (SPA) | | | | |
| Owenduff/Nephin Complex SPA [004098]<br><br>**Distance:** 0.1km | - Merlin (*Falco columbarius*) [A098]<br>- Golden plover (*Pluvialis apricaria*) [A140] | This site has the generic conservation objective:<br><br>'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA' | There will be no direct effects on supporting habitats as the project footprint is located entirely outside the designated site. However, as the proposed development is within the range of both | Yes – Potential for significant effect has been identified and there is a need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | (NPWS (2022) Conservation objectives for Owenduff/Nephin Complex SPA [004098]. Generic version 1.0. Department of Housing, Local Government and Heritage.) | SCI species (SNH 2016), there is potential for injury or mortality due to turbine collision during the operational phase. Due to the proximity of the SPA to the grid connection route, there is potential for water pollution and pollution with dust arising from the proposed works and as such there is potential of deterioration of supporting habitats of the SCIs of this SPA during the construction phase.<br><br>Following the precautionary principle, due to the close proximity of the proposed development to the SPA, there is also potential for *in* and *ex situ* disturbance and displacement of SCI | |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | species during the construction, operational and decommissioning phases.<br><br>**The SPA is considered to be within the Likely Zone of Impact and further assessment is required.** | |
| Carrowmore Lake SPA [004052]<br><br>**Distance:** 6.9km | › Sandwich tern (*Sterna sandvicensis*) [A191] | This site has the generic conservation objective:<br><br>'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'<br><br>(NPWS (2022) Conservation objectives for Carrowmore Lake SPA [004052]. Generic version 1.0. Department of Housing, Local Government and Heritage.) | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>There is no downstream surface water connectivity between the proposed development and the Designated Site and no pathway for indirect effects on the supporting habitats of the SCI species was identified. | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | The proposed development site offers no suitable habitat for Sandwich tern and there is no potential for significant effect on this species. Due to the lack of connectivity between the proposed development and the European Site, no complete impact source-pathway-receptor chain exists and there is no potential for significant effect on this SPA.<br><br>**The SPA is not within the Likely Zone of Impact and no further assessment is required.** | |
| Blacksod Bay/ Broadhaven SPA [004037] | › Red-throated Diver (*Gavia stellata*) [A001]<br>› Great Northern Diver (*Gavia immer*) [A003] | Detailed conservation objectives for this site (Version 1, December 2014) were reviewed as part of the assessment and are available at | There will be no direct effects as the project footprint is located | No – Potential for significant effect has been excluded and there is no need to progress to |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| **Distance:** 9.2km | › Slavonian Grebe (*Podiceps auritus*) [A007]<br>› Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]<br>› Common Scoter (*Melanitta nigra*) [A065]<br>› Red-breasted Merganser (*Mergus serrator*) [A069]<br>› Ringed Plover (*Charadrius hiaticula*) [A137]<br>› Sanderling (*Calidris alba*) [A144]<br>› Dunlin (*Calidris alpina*) [A149]<br>› Bar-tailed Godwit (*Limosa lapponica*) [A157]<br>› Curlew (*Numenius arquata*) [A160]<br>› Sandwich Tern (*Sterna sandvicensis*) [A191]<br>› Dunlin (*Calidris alpina schinzii*) [A466]<br>› Wetland and Waterbirds [A999] | https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004037.pdf. | entirely outside the designated site.<br><br>The closest surface water connectivity (about 30km surface water distance) with the SPA has been identified via the watercourses that flow from the development site into the Owenmore River which flows into Tullaghan Bay. However, due to the nature, scale and location of the proposed development along with the attenuation provided by the intervening 30km of river channel there is no potential for significant effect on water quality.<br><br>The proposed development site offers no suitable habitat for | Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | | any of the SCIs apart from Curlew but is located outside of the maximum range of this species (2km; SNH 2016) and there is no potential for significant impact any of the SCI species.<br><br>**There is no potential for significant effect on this SPA and no further assessment is required.** | |
| Illanmaster SPA [004074]<br><br>**Distance:** 13.9km | - Storm Petrel (*Hydrobates pelagicus*) [A014] | This site has the generic conservation objective:<br><br>'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA'<br><br>(NPWS (2022) Conservation objectives for Illanmaster SPA [004074]. Generic | There will be no direct effects as the project footprint is located entirely outside the designated site.<br><br>There is no direct surface water connectivity between the proposed development and the Designated Site, which is buffered from the closest outlet of the | No – Potential for significant effect has been excluded and there is no need to progress to Stage 2 of the Appropriate Assessment process. |

| European Sites and distance from proposed development | Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 06/01/2022 and 22/02/2023 | Conservation Objectives | Likely Zone of Impact Determination | Possibility of Significant Effects? (If Yes Progress To Stage 2 Of AA Process) |
|---|---|---|---|---|
| | | version 1.0. Department of Housing, Local Government and Heritage.) | Owenmore River and by more than 60km of the Atlantic Ocean. Due to the nature, scale and location of the proposed works along with the buffering properties of the intervening waterbodies, there is no potential for significant effects arising from water pollution.<br><br>The proposed development site offers no suitable habitat for Storm Petrel and there is no potential for significant effect on this species.<br><br>**There is no potential for significant effect on this SPA and no further assessment is required.** | |

## 3.2 European Sites with the Potential to be Significantly Affected by the Proposed Development

Due to the proximity of the proposed development to these sites and on a precautionary basis, there is potential for significant effects on the following European Sites in the form of habitat degradation during the construction, operational and decommissioning phases, e.g. drainage or hydrological changes:

- Carrowmore Lake Complex SAC [000476]
- Slieve Fyagh Bog SAC [000542]
- Glenamoy Bog Complex SAC [000500]
- Bellacorick Bog Complex SAC [001922]

Due to the proximity of the proposed grid connection to these sites and on a precautionary basis, there is potential for significant effects on the following European Sites in the form of water pollution and pollution with dust arising from works along the proposed grid connection route during the construction phase:

- Carrowmore Lake Complex SAC [000476]
- Bellacorick Bog Complex SAC [001922]
- Owenduff/Nephin Complex SAC [000534]
- Owenduff/Nephin Complex SPA [004098]

Due to the potential of surface water pollution of watercourses within and in the proximity of the SAC which are likely used by QI species, there is potential for significant effects on the following European Site a result of water pollution during the construction, operational and decommissioning phases:

- Owenduff/Nephin Complex SAC [000534]
- Bellacorick Bog Complex SAC [001922]

Due to the presence of suitable habitat for QI species within and immediately surrounding the proposed development site and due to the close proximity of the proposed development and grid connection route to the SAC, there is potential for *in* and *ex situ* disturbance and displacement of QI species within this European Site during the construction and decommissioning phases:

- Owenduff/Nephin Complex SAC [000534]

Due to the close proximity of the proposed development to the SPA, there is potential for *in* and *ex situ* disturbance and displacement of the SCI species of this European Site during the construction, operational and decommissioning phases:

- Owenduff/Nephin Complex SPA [004098]

## 3.3 Likely Cumulative Impact of the Proposed Works on European Sites, in-combination with other plans and projects

Where the potential for significant effects on European Sites has been identified in the preceding sections of this document, there is potential for the proposed development to result in in-combination effect. This potential is addressed in the NIS that accompanies this application.

Where no pathway for effect on a particular European Site was identified, there is no potential for any effects to occur as a result of the proposed development when considered on its own. Therefore, there is no mechanism for it to contribute to any in-combination effects on that site when considered in combination with other plans and projects and no further assessment is required.

# 4. ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING STATEMENT AND CONCLUSIONS

## 4.1 Concluding Statement

Following an examination, analysis and evaluation of the relevant data and information set out within this Screening Report, it cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European Sites, that the proposed development, individually or in combination with other plans and projects, would be likely to have a significant effect on the following sites:

- Carrowmore Lake Complex SAC [000476]
- Slieve Fyagh Bog SAC [000542]
- Glenamoy Bog Complex SAC [000500]
- Bellacorick Bog Complex SAC [001922]
- Owenduff/Nephin Complex SAC [000534]
- Owenduff/Nephin Complex SPA [004098]

As a result, it is respectfully submitted that an Appropriate Assessment is required, and a Natura Impact Statement has been prepared in respect of the proposed development in order to assess whether the proposed development will adversely impact the integrity of these European Sites.

No pathway from the Proposed Development, by itself or in combination with any other plan or project, for significant effect on any other European Site were identified. Thus, it can be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the Proposed Development, individually or in combination with other plans and projects, would be likely to have a significant effect on any other European Sites other than those listed above.

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# APPENDIX 2

## *CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)*

Planning and Environmental Consultants

# Construction and Environmental Management Plan

## Proposed Sheskin South Wind Farm

# DOCUMENT DETAILS

| | |
|---|---|
| Client: | **Sheskin South Sheskin South Renewables Power Designated Activity Company** |
| Project Title: | **Proposed Sheskin South Wind Farm** |
| Project Number: | **201119** |
| Document Title: | **Construction and Environmental Management Plan** |
| Document File Name: | **CEMP D4 – 2023.02.013 - 201119** |
| Prepared By: | **MKO**<br>**Tuam Road**<br>**Galway**<br>**Ireland**<br>**H91 VW84** |

| Rev | Status | Date | Author(s) | Approved By |
|---|---|---|---|---|
| 01 | Draft | 16/11/2022 | JF | EM |
| 02 | Draft | 23/01/2023 | JF | EM |
| 03 | Draft | 12/02/2023 | JF | EMC |
| 04 | Final | 13/02/2023 | JF | EMC |

# Table of Contents

# 1. INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by MKO on behalf of Sheskin South Renewables Power Designated Activity Company (DAC) who intend to apply to An Bord Pleanála for planning permission for the construction of a wind energy development, comprising up to 21 no. wind turbines and associated infrastructure in the townland of Sheskin near the village of Bangor Erris, Co. Mayo.

The CEMP has been prepared in conjunction with the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS) which will accompany the planning application for the Proposed Development to be submitted to An Bord Pleanála. Should the project secure planning permission, the CEMP will be updated, in line with all conditions and obligations which apply to any grant of permission. The CEMP should be read in conjunction with the EIAR and planning drawings. This CEMP is a key contract document which the Contractor will be legally required to implement. The CEMP due to its structure and nature will also require constant updating and revision throughout the construction period where required under any planning condition. Therefore, this is a working document and will be developed further prior to and during the construction phase of the Proposed Development.

Triggers for amendments to the CEMP will include:

- When there is a perceived need to improve performance in an area of environmental impact;
- As a result of changes in environmental legislation applicable and relevant to the project;
- Where the outcomes from auditing establish a need for change;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendment.
- Any amendments will be in full compliance with the planning consent and mitigation measures as presented in the EIAR, NIS and all other relevant planning documents.

This report provides the environmental management framework to be adhered to during the pre-commencement, construction and operational phases of the Proposed Development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur.

This report is intended as a single, amalgamated document that can be used during the future phases of the project, as a single consolidated point of reference relating to all construction, environmental and drainage requirements for the Planning Authority, developer and contractors alike.

## 1.1 Scope of the Construction and Environmental Plan

This report is presented as a guidance document for the construction of the proposed Sheskin South Wind Farm. Where the term 'site' is used in the CEMP it refers to all works associated with the Proposed Development. The CEMP outlines clearly the mitigation measures and monitoring proposals that will be adhered to in order to complete the works in an appropriate manner.

The report is divided into nine sections, as outlined below:

- Section 1 provides a brief introduction as to the scope of the report.

- Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of construction methodologies that will be adopted throughout the project.
- Section 3 sets out details of the environmental controls to be implemented on site. Site drainage measures, peat stability monitoring measures and a waste management plan are also included in this section.
- Section 4 sets out a fully detailed implementation plan for the environmental management of the project outlining the roles and responsibilities of the project team.
- Section 5 outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.
- Section 6 consists of a summary table of all mitigation proposals to be adhered to during the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- Section 7 consists of a summary table of all monitoring requirements and proposals to be adhered to during the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- Section 8 sets out a programme for the timing of the works.
- Section 9 outlines the proposals for reviewing compliance with the provisions of this report.

# 2. SITE AND PROJECT DESCRIPTION

## 2.1 Site Location

The Proposed Development is located within existing commercial forestry properties in the townland of Sheskin, approximately 6 kilometres (km) east of the village of Bangor Erris, Co. Mayo. The site location context is shown in Figure 2-2a and Figure 2-2b.

Access to the site, for Heavy Goods Vehicles (HGV) and abnormal loads (e.g. turbine components) will be via an existing forestry access road at the southeastern corner of the site, off a local road (L52926) which in turn is accessed from the N59 National Secondary route. The two other existing access junctions, also located on the eastern side of the site will be utilised to provide access for general site traffic such as construction staff and Light Goods Vehicles (LGV).

It is intended to connect the development to the national electricity grid via a 110kV underground cable which will connect the Sheskin South wind farm substation to the existing Bellacorick 110kV substation, located 5km southeast of the intended on-site 110kV substation, in the townland of Bellacorick. The grid connection cabling route will measure approximately 6.9km in length. Neither the on-site substation nor the grid connection cabling route form part of the planning application, however, they are assessed in this EIAR.

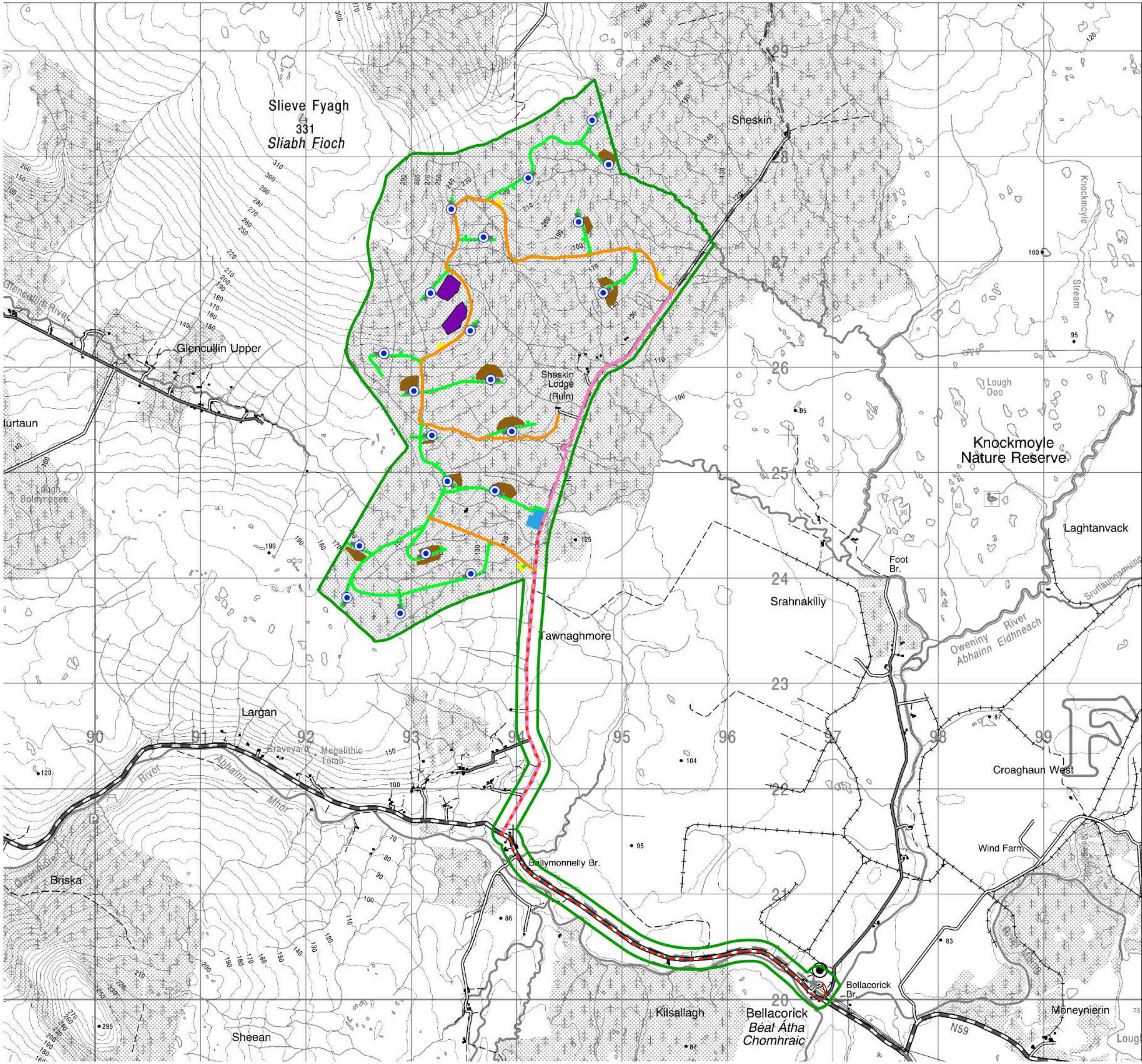
Works required along the intended turbine delivery route, between Galway Port and the proposed main site entrance do not form part of the planning application, however, they have been assessed as part of this EIAR.

A full and detailed description of the Proposed Development (Sheskin South Wind Farm) for the purposes of the planning application and the additional elements that form part of the overall project, assessed in this EIAR, is contained in Chapter 4 of this EIAR. For the purposes of this EIAR, the wind farm, substation, grid connection and turbine delivery route accommodation works are collectively referred to as the "Proposed Development". The substation and grid connection are included in the Proposed Development for the purposes of the assessment in the EIAR, however it is not included in the planning application.

The townlands within which the project (i.e. the main proposed wind farm site, the on-site substation the grid connection cabling route and turbine delivery route accommodation works) is located are listed in Table 1-1. All townlands are located in Co. Mayo.

*Table 2-1 Townlands within which the project is located*

| Townlands within which the project is located: | |
|---|---|
| **Proposed Wind Farm Development** | |
| Sheskin | - |
| **Intended Wind Farm Substation Location and Grid Connection Cabling Route** | |
| Sheskin | Tawnaghmore |
| Kilsallagh | Bellacorrick |
| **Turbine Delivery Route Accommodation Works** | |
| Tawghnamore | Ballyglass East |



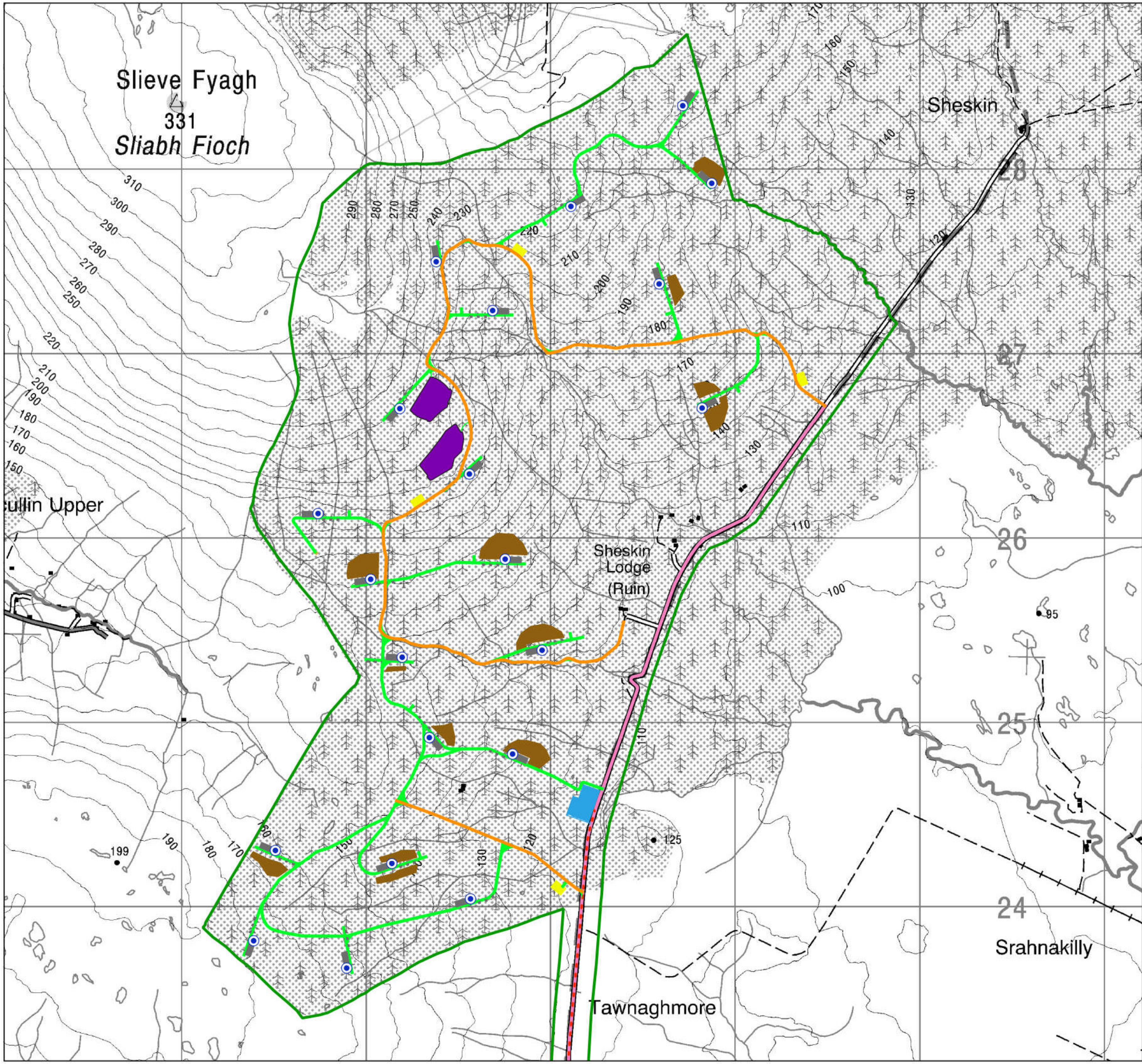

## Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Met Mast Location
- Proposed New Roads
- Existing Roads - Upgrade Proposed
- Existing Roads - Upgrade Required (Not Proposed)
- Turbine Foundation & Crane Hardstands
- Peat Placement Areas
- Proposed Construction Compounds
- Proposed Grid Connection Route
- Proposed Substation Compound
- Proposed Borrow Pits
- Proposed Met Mast Platform
- Bellacorrick Substation



| Drawing Title | |
|---|---|
| Proposed Site Layout | |
| Project Title | |
| Sheskin South Wind Farm Co. Mayo | |
| Drawn By: DOS | Checked By: EM |
| Project No.: 201119 | Drawing No.: 2-2a |
| Scale: 1:35,000 | Date: 2023-02-23 |

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie




## Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
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- Existing Roads - Upgrade Proposed
- Existing Roads - Upgrade Required (Not Proposed)
- Turbine Foundation & Crane Hardstands
- Peat Placement Areas
- Proposed Construction Compounds
- Proposed Grid Connection Route
- Proposed Substation Compound
- Proposed Borrow Pits
- Proposed Met Mast Platform



| Drawing Title | |
|---|---|
| Core Site Layout | |
| Project Title | |
| Sheskin South Wind Farm Co. Mayo | |
| Drawn By | Checked By |
| DOS | EM |
| Project No. | Drawing No. |
| 201119 | 2-2b |
| Scale | Date |
| 1:20,000 | 2023-02-23 |

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

## 2.2 Description of the Development

The proposed wind farm development comprises the construction of 21 No. wind turbines and all associated works. The proposed turbines will have a blade tip height of 200 metres above the top of the foundation. The applicant is seeking a ten-year planning permission. The full description of the proposed wind farm development, as per the public planning notices, is as follows:

- i. *Construction of 21 no. wind turbines and associated hardstand areas with the following parameters:*
- ii. *A total tip height of 200 metres,*
- iii. *Hub height of 115 metres, and*
- iv. *Rotor diameter of 170 metres*
- v. *All associated underground electrical and communications cabling;*
- vi. *1 no. Meteorological Mast of 115 metres in height, and associated hardstanding area;*
- vii. *Upgrade of existing tracks and roads, provision of new permanent site access roads, upgrade of 2 no. existing site entrances, construction of 1 no. new site entrance;*
- viii. *2 no. borrow pits;*
- ix. *12 no. permanent peat placement areas;*
- x. *4 no. temporary construction compounds with temporary site offices and staff facilities;*
- xi. *Permanent recreation and amenity works, including marked trails, seating areas, viewing point, amenity car park, and associated amenity signage;*
- xii. *Site Drainage;*
- xiii. *Site Signage;*
- xiv. *Ancillary Forestry Felling to facilitate construction and operation of the proposed development;*
- xv. *All works associated with the habitat enhancement and biodiversity management within the wind farm site; and*
- xvi. *All associated site development works and ancillary infrastructure.*

This application is seeking a ten-year permission and 35 year operational life from the date of commissioning of the renewable energy development.

As stated in Section 2.1 above, it is intended to connect the development to the national electricity grid via a 110kV underground cable which will connect the Sheskin South wind farm substation to the existing Bellacorick 110kV substation, located 5km southeast of the intended on-site 110kV substation, in the townland of Bellacorick. The grid connection cabling route will measure approximately 6.9km in length. Neither the on-site substation nor the grid connection cabling route form part of the planning application, however, they are assessed in this EIAR.

The layout of the Proposed Development is shown on Figure 2-2a and 2-2b.

## 2.3 Targets and Objectives

The construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the EIAR, NIS and associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning documents for the development;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to construction; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. excavated stone, overburden and peat material;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation listed throughout this document; and,
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

## 2.4 Construction Methodology Overview

### 2.4.1 Introduction

An experienced main contractor will be appointed for the civil works for the construction phase of the Proposed Development. The appointed contractor for the works will be required to comply with this CEMP and any revisions made to this document in the preparation of method statements for the various elements of the construction phase of the Proposed Development. An overview of the proposed Construction and Demolition Methodologies is provided below.

## 2.4.2 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Temporary Construction Compounds;
- Borrow Pits;
- Peat Placement Areas
- Tree Felling;
- Site Drainage System;
- Site Access Roads;
- Turbine and Meteorological Mast Foundations;
- Crane Hardstands;
- Onsite Electricity Substation, Control Buildings and Battery Storage;
- Site Underground Cabling
- Grid Connection Construction Methodology
- Existing Underground Services
- Joint Bays
- Grid Connection Watercourse/Culvert Crossings
- Watercourse/Service Crossings
- Transport Route Accommodation Works
- Decommissioning

## 2.4.3 Temporary Construction Compounds

There are four temporary construction compounds proposed for the site. The location of the compounds are shown in Figure 2-2b. The compounds will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds (refer to Section 3.2.2 below) will be installed around the perimeter;
- The compound will be established using a similar technique as the construction of the excavated site roads as discussed above;
- Where required, a layer of geogrid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc.;
- If necessary, the compound will be fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism is envisaged; and,
- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with peat material as required.
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor as required and will be removed from the site on completion of the construction phase.
- The water supply to the compounds will be from a temporary water storage tank which will be filled using a mobile water tank which will source water locally as required.

### 2.4.4 Borrow Pits

It is proposed to develop two on-site borrow pits. The first borrow pit is to be located within 35m of an existing forest road and within 35m of a proposed new road leading to Turbine No. 7. The second borrow pit is to be located approximately 100m south of Borrow Pit No. 1 and is within 30m of an existing forest road and 60m of a proposed new road leading to Turbine No. 9, as shown in Figure 2-2b. The borrow pits will be excavated and backfilled, as outlined in the Peat and Spoil Management Plan compiled by Fehily Timoney (Appendix 4-2 of the EIAR), as follows:

- The rock within the proposed borrow pit footprints will be removed by either breaking or blasting depending on its excavability, which will be determined from confirmatory ground investigation carried out at the proposed borrow pits. The ground investigation shall comprise rotary core drilling with associated engineering logging including rock quality designation and strength and durability testing.
- It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, localised deepening of the borrow pit floors may be required depending on extraction operations.
- It may be possible to excavate the rock from the borrow pits whilst leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil. The upstands/segments of intact rock will essentially act as engineered rock buttresses within the pits, forming a series of cells (4 no.). The cells will be opened in sequence and filled as needed.
- Slopes within the excavated rock formed the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.
- The stability of the rock faces within the borrow pits will be inspected by the project Geotechnical Engineer upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock, in line with best practice guidelines.
- Where it is not possible to leave upstands/segments of intact rock in place it will be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock buttresses should be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress should be inspected and approved by a competent person.
- The rock buttresses will be constructed in stages to allow infilling of peat and spoil within cells. The buttress will be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil.
- Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. Leaving in place upstands/segments of intact rock which will help to retain the placed peat spoil and will allow the borrow pit to be developed and infilled in cells. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.
- A number of rock buttresses to form cells with the borrow pits may be required to ensure access for trucks and excavators can be achieved.
- The rock buttresses should be wide enough to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The permanent side slopes of the rock buttress should be constructed between 40 to 60 degrees.

- A rock buttress will be required on the downslope side of the borrow pits to safely retain the infilled peat and spoil. The height of the berm constructed will be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. A berm up to 6m (approx..) in height will be required.
- The rock buttress will be founded on granular Glacial Till or bedrock i.e. competent strata. The founding stratum for the rock buttress should be inspected and approved by the Project Geotechnical Engineer.
- A level surface in the underlying granular Glacial Till or Weathered Bedrock will be prepared before placing and compacting the rock fill used to construct the berms.
- In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability. The buttress will be constructed of well graded granular rock fill of about 100mm up to typically 500mm in size. In addition, drains will be placed through the buttresses to allow surface water to drain from the surface of the placed peat.
- The rock buttress will be wide enough (up to 4m) during construction to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The side slopes of the rock buttress will be constructed at between 40 to 60 degrees.
- The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.
- The surface of the placed peat and spoil should be shaped to allow efficient run-off of surface water from the placed arisings.
- As the berms are slightly higher than the retained peat, drains will be provided at regular intervals through the berms, at the same level as the top of the peat surface, to prevent ponding of water around the edges of the repositories. These drains will be 150mm diameter flexible plastic drainage pipe or equivalent.
- A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.
- An interceptor drain should also be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.
- Temporary control of groundwater within the borrow pits may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will be required during construction.
- Settlement ponds have been designed at the lower side/outfall location of the borrow pits.
- The acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.
- Supervision by the Project Geotechnical Engineer is required for the development of the borrow pits.
- All the above-mentioned general guidelines and requirements will be implemented by the Contractor during construction.

Further guidelines on the construction of the borrow pit are included within Section 5-4 of the Peat & Spoil Management Plan (Appendix 4-2 of the EIAR)

Post-construction, the borrow pit areas will be permanently secured and a stock-proof fence will be erected around the borrow pit areas to prevent access to these areas. Appropriate health and safety signage will also be erected on this fencing and at locations around the fenced area.

### 2.4.5 Peat Placement Areas

A number of areas within the site have been identified as suitable for the placement of peat and are shown in Figure 2-2b. The peat placement areas are located adjacent to the hardstands and foundations of Turbines No. 2, 3, 4, 6, 9, 10, 14, 15, 16, 19, 20 and 21.

The placement of peat and spoil within the peat placement areas will be undertaken as follows:

- Excavated peat will be place across the clearfell areas around 12 no. of the proposed turbines.
- The peat placed within these areas will be restricted to a maximum height of 1m. Weak/liquified peat must be placed within the proposed borrow pits and not stored within these areas.
- The placement of excavated peat will be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and spoil within the placement areas will be carried out using long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.
- Where there is any doubt as to the stability of the peat surface, no material shall be placed on to the peat surface. The risk of peat instability is reduced by not placing any loading onto the peat surface.
- It should be ensured that the surface of the placed peat is shaped to allow efficient run-off of surface water. Shaping of the surface of the peat should be carried out as placement of peat within the placement area progresses. This will reduce the likelihood of debris run-off and reduce the risk of instability in the placed peat.
- Finished/shaped side slopes in the placed peat shall not be greater than 1(v): 4(h). This slope inclination will be reviewed during construction as appropriate.
- When placing peat, the acrotelm shall be placed on the finished surface with the vegetation part of the sod facing the right wat up to encourage growth of plants and vegetation at the surface of the placed peat within the placement areas.
- Movement monitoring instrumentation will be placed around the areas where peat has been placed. The locations where monitoring is required will be identified by the designer on site.
- Supervision by the Project Geotechnical Engineer is required for the establishment of the peat placement areas.
- An interceptor drain will be installed upslope of the designated peat placement areas to divert any surface water away from these areas. This will help to ensure stability of the placed peat and reduce the likelihood of debris run-off.
- All of the above-mentioned guidelines and requirements will be confirmed by the designer prior to construction.

### 2.4.6 Tree Felling

The majority of the site (62%) currently comprises commercial coniferous forestry plantation. As part of the Proposed Development, tree felling will be required within and around the development footprint to allow the construction of turbine bases, access roads and the other ancillary infrastructure.

A total of 117 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development in order to facilitate infrastructure construction and turbine erection.

The tree felling activities required as part of the Proposed Development will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

The estimated 117 hectares that will be permanently felled for the footprint of the turbines and the other infrastructure and turbine erection will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that might be issued in respect of the Proposed Development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The proposed methodology for the forestry felling activities is as follows:

Felling works will conform to current best practice Forest Service policies and strategic guidance documents as well as Coillte produced guidance documents, including the specific guidelines listed below, to ensure that the felling works provides minimal potential impacts to the receiving environment.

- 'Standards for Felling and Reforestation' (Department of Agriculture, Food and the Marine, 2019)
- 'Forest Operations & Water Protection Guidelines' (Coillte, 2009)
- 'Methodology for Clear Felling Harvesting Operations' (Coillte, 2009)
- 'Forestry and Water Quality Guidelines' (Forest Service, 2000)
- 'Forestry Biodiversity Guidelines' (Forest Service, 2000)
- 'Forestry Protection Guidelines' (Forest Service, 2002)
- 'Forestry Harvesting and Environmental Guidelines' (Forest Service, 2000)

The proposed methodology for the forestry felling activities is as follows:

- The extent of all necessary forestry felling areas will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected by the ECoW and contractor prior to any machinery being brought on site to commence the felling operation.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt/sediment traps (i.e.. check dam / silt fence) will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed.
- New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated.
- Sediment removed from traps will be carefully disposed of in the peat repository areas.
- Machine combinations (i.e. hand-held or mechanical) will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; however, the general proposed machine combination will comprise a harvester and a low-ground pressure harvester with a 14-tonne bunk capacity.
- Trees will be cut manually inside the 50m construction watercourse buffer and using machinery to extract whole trees only;
- Brash mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.
- Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.
- No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.

- Brash which has not been pushed into the soil may be moved to facilitate the creation of mats elsewhere within the site.
- Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.
- Harvested timber will be stacked in dry areas, and outside any 50-metre watercourse buffer zone prior to removal off site to authorised saw mills.

### 2.4.7 Site Drainage Systems

The early establishment of temporary drainage facilities will manage the risk of impacts on watercourses on and adjacent to the site during construction. In addition, construction operations will adopt best working practices which are outlined in section 3.2.3 Best Practice Guidelines below. The development of the site will be phased accordingly. The construction of the drainage will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses. They will be designed with sufficient flexibility to respond to an early phase incoming flow during the construction phase.

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated, and settlement ponds constructed to eliminate any suspended solids within surface water running off the site. Surface water management and drainage design is dealt with in Section 4.7 of the EIAR and in the Surface Water Management Plan (included as Appendix 4-4 of the EIAR).

### 2.4.8 Site Access Roads

The road construction design has taken into account the following key factors as stated in the Fehily Timoney & Company's (FT) Peat & Spoil Management Plan in Appendix 4-2 of the EIAR:

- Buildability considerations
- Serviceability requirements for construction and wind turbine delivery and maintenance vehicles
- Minimise excavation arising
- Requirement to minimise disruption to peat hydrology

Whilst the above key factors are used to determine the road design the actual construction technique employed for a particular length of road are determined on the prevailing ground conditions encountered along that length of road.

The proposed upgrade to existing roadways and construction of new roadways will incorporate passing bays to allow traffic to pass easily while traveling around the site.

The 2 no. road construction types proposed are as follows:

- Existing Roads to be Upgraded
  - Excavate and Replace
- Proposed New Roads
  - Excavate and Replace

The locations where the above construction types are proposed is shown in Figure 1-1 of the Peat & Spoil Management Plan. This document is included as Appendix 4-2 of this EIAR.

### 2.4.8.1 Upgrade to Existing Roads or Tracks

It is proposed to utilise the existing road network at the site as much as possible (approximately 8km will be used). The general construction methodology for upgrading of existing sections of excavated roads or tracks, as presented in Fehily Timoney's Peat & Spoil Management Plan in Appendix 4-2, is summarised below. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

- *Access road construction will be to the line and level requirements as per design/planning conditions.*
- *For upgrading of existing excavated access tracks the following guidelines apply:*
  - *(a) Excavation of the widened section of access road will take place to a competent stratum beneath the peat, removing all peat and soft clay and backfilled with suitable granular fill.*
  - *(b) Benching of the excavation will be required between the existing section of access road and the widened section of access road where the depth of excavation exceeds 500mm.*
  - *(c) The surface of the existing access track will be overlaid with up to 500mm of selected granular fill.*
  - *(d) Access roads will be finished with a layer of capping across the full width of the track.*
  - *(e) A layer of geogrid/geotextile will be implemented at the surface of the existing access track where the existing track shows signs of excessive rutting, etc.*
  - *(f) For excavations in peat, side slopes will be not greater than 1(v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.*
- *The finished road width will have a running width of 5m, with wider sections on bends and corners.*
- *On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.*

### 2.4.8.2 Construction of New Excavated Roads

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. The proposed locations for new access roads on site are shown in Figure 2-2b.

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites provided sufficient placement/reinstatement capacity is available on site for the excavated peat. The following process will be implemented:

- *Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.*
- *Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.*
- *Excavation of roads will be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat..*
- *Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road should be excavated without re-placement with stone fill.*
- *Once excavated, peat will be temporarily stored in localised areas adjacent to excavations for roads and hardstands before being placed into the permanent peat storage areas within the borrow pits. All peat placement areas will be upslope of founded roads/hardstands and will be inspected by the Projects Geotechnical Engineer before material is stored in the area.*
- *Excavation of materials with respect to control of peat stability:*

(a) *Acrotelm (top about 0.3 to 0.4m of peat) will be required for landscaping and will be stripped and temporarily stockpiled for re-use. Acrotelm stripping will be undertaken prior to main excavations.*
(b) *Where possible, the acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.*
(c) *All catotelm peat (peat below about 0.3 to 0.4m depth) will be transported immediately on excavation to the designated peat placement areas.*

- *Excavated side slopes in peat shall not be greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Should areas of weaker peat be encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.*
- *End-tipping of stone onto the road during the construction/upgrading of the access road will be carefully monitored to ensure that excessive impact loading, which may adversely affect the adjacent peat, is limited.*
- *The excavated access road will be constructed with a minimum of 1000mm of selected granular fill. Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works.*
- *A layer of geogrid/geotextile may be required at the surface of the competent stratum.*
- *Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.*
- *A final surface layer will be placed over the excavated road and graded to accommodate wind turbine construction and delivery traffic.*
- *The construction and upgrading of access roads in areas of deep peat (greater than 2m) will be inspected on a routine basis (by the Site manager/Ecological Clerk of Works/Project Geotechnical Engineer) during the works, particularly before/following trafficking by heavy vehicular loads.*

## 2.4.9 Turbine and Meteorological Mast Foundations

The wind turbines and meteorological mast foundations will be a reinforced concrete base designed to Eurocode 2/BS8110. Foundation loads will be provided by wind turbine and mast supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation using a bolt assembly which shall be cast into the concrete. The meteorological mast is a free-standing structure which is also anchored to the reinforced concrete foundation. It is anticipated that the foundations for both the turbines and the meteorological mast will be ground bearing foundations and that the formation level of the turbine foundations will be on the lower mineral subsoil or bedrock. For completeness and depending on findings of the confirmatory ground investigations, reinforced concrete-piled foundations have also been considered. Turbine bases will measure approximately 25 metres in diameter, while the meteorological mast base will measure approximately 25 square metres. They will be formed a minimum of one metre below the base of the peat layer on stiff subsoil material or bedrock, or at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- Where practical, the peat will be stripped over the area of the excavation and stored locally for reuse, the subsoil will be excavated and stored to one side for reuse during the landscaping around the finished turbine;
- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system prior to discharge from the works area;

- Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring to identify any significant remains as they come to light and,
- The foundation excavation will be raised to formation level by compacted layers of well graded granular material, spread and compacted to provide a hard area for the turbine foundation.

Standard excavated reinforced concrete bases will be completed as follows:

- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete will be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;
- High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools;
- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;
- The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to turbine manufacturer for their approval;
- Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
- Steel shutters will be used to pour the circular chimney section;
- Earth wires will be placed around the base; and,
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set aside during the excavation.
- Soil, rock and other materials excavated during construction shall be managed in line with the recommendations/ best practice guidelines outlined in Section 4.3.4 of Chapter 4 of the EIAR.

Reinforced concrete piled foundations will be completed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- No material will be removed from site and placement areas will be stripped of vegetation prior to placement in line with best working practices;

A piling platform for the piling rig will be constructed. This will be done by laying geotextile on the existing surface and a stone layer will then be placed on top of the geotextile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.

- The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the peat from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
- When the auger and the sleeve are removed high tensile steel cages will be lowered into the boreholes. These steel cages will extrude above the level of the top of the concrete pile.
- As the auger is removed concrete is pumped into the borehole.
- Reinforcing steel on the top of the pile will tie to the foundation base steel.
- The procedure for standard excavated reinforced concrete bases as outlined below can be applied from here.

#### 2.4.9.1 Crane Hardstands

All crane pads will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure approximately to the turbine manufacturer's requirements. The position of the crane pads varies between turbine locations depending on topography, position of the site access road, and the turbine position.

### 2.4.10 Onsite Electricity Substation and Control Buildings

Once tree felling as described in Section 2.4.2.3, above, is completed, the onsite substation will be constructed by the following methodology:

- The area of the onsite substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the on-site peat repositories or the proposed borrow pit, for reinstatement purposes.
- The dimensions of the onsite substation area have been designed to meet the requirements of the ESB/Eirgrid and the necessary equipment to safely and efficiently operate the proposed wind farm;
- 2 no. control buildings will be built within the onsite substation compound;
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix;
- The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- The roof slabs will be lifted into position using an adequately sized mobile crane;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation will be to ESB/Eirgrid specifications.

### 2.4.11 Site Underground Cabling

The transformer in each turbine is connected to the substation through a network of buried electrical cables. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The internal site cabling trenches will be located within the footprint of the wind farm site roads. The ground is trenched using a mechanical excavator. The top layer of granular fill is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables are to meet all national and international requirements and will generally be up to 1.2 m below ground level, depending on the ground conditions that are encountered. A suitable marking tape is installed between the cables and the surface. On completion the ground will be reinstated as per its original condition.

Clay plugs will be installed at regular intervals of not greater than 50 metres along the length of the trenches where required to prevent the trenches becoming conduits for runoff water. While the majority of the cable trenches will be backfilled with native material, clay subsoils of low permeability will be used to prevent conduit flow in the backfilled trenches. This material will be imported onto the site from local, authorised quarries should sufficient volumes not be encountered during the excavation phase of roadway and turbine foundation construction.

### 2.4.12 Grid Connection Construction Methodology

The underground cabling (UGC) works will consist of the installation of 6 No. ducts in an excavated trench to accommodate 3 No. power ducts, 2 No. fibre communications ducts to allow communications between the Sheskin South Wind Farm Substation and the existing Bellacorick 110kV substation and 1 No. earth continuity conductor duct.

The power cable ducts will accommodate the power cables and the communications duct will accommodate a fibre cable to allow communications between the 110kV Sheskin South Wind Farm substation and the existing 110kV Bellacorick substation. The ducts will be installed and the trench will be reinstated in accordance with landowner or local authority specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately every 700m to 850m. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of Eirgrid.

The underground cable required to facilitate the grid connection will be laid beneath the surface of the site and/or public road using the following the methodology summarised below, and outlined in detail in TLI Group's *Sheskin South Wind Farm 110kV Grid Connection – Construction Methodology* included as Appendix 4-5 of this EIAR:

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the EIAR and as required by planning conditions where relevant;
- All existing underground services along the UGC route shall be confirmed prior to the commencement of construction works;
- Traffic management measures will be implemented in accordance with those included in Section 14.1 of the EIAR, and a detailed Traffic Management Plan will be prepared and agreed with Mayo County Council;
- The excavated trench will be approximately 825mm in width and approximately 1315mm deep both within the public road network and within private lands;
- The 160mm diameter HDPE cable ducting will be placed into the prepared trench, inspected and backfilled.
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Environmental Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported to on of the two proposed on-site borrow pits;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature (please refer to Chapter 9 of the EIAR);
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;

- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Works will only be conducted in normal working hours of Monday to Friday 07:00 to 19:00 and Saturday 07:00 to 13:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of ana emergency;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day.
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the EIAR, the CEMP and best practice construction methodologies;

*Plate 2-1 Cable Trench View*

### 2.4.12.1 Existing Underground Services

In order to facilitate the installation of an underground grid connection, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake pre-commencement surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

If existing low voltage underground cables are found be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, the underground cables will then be re-energised.

In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the specifications of the relevant utility provider.

### 2.4.12.2 Joint Bays

Joints Bays are to be provided approximately every 700m to 850m along the UGC routes to facilitate the jointing of 2 no. lengths of UGC. 110kV Joint Bays are typically 2.5m x 6m x 2.05m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between Sheskin South Wind Farm and the existing Bellacorick 110kV Substation. Earth sheath links are used for earthing and bonding cable sheaths of underground power cables, installed in a flat formation so that the circulating currents and induced voltages are eliminated or reduced. Earth sheath link chambers and communication chambers are located close to joint bays. Earth sheath link chambers and communication chambers will typically be pre-cast concrete structures with an access cover at the finished surface level.

Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. The marker posts will consist of a corrosion-proof aluminium triangular danger sign, with a 750mm base, and with a centred lightning symbol, on engineering grade fluorescent yellow background.

They will be installed inadequately sized concrete foundations and will also be placed where the cable has not been buried to the standard depth, due to existing road conditions. Drawings of the joint bays and communication chambers are included within this planning package.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers, within the curtilage of the public road, is subject to approval by ESBN and EirGrid.

The locations of the joint bays are shown in the grid connection layout drawings in Appendix 4-6 of this EIAR.

### 2.4.12.3 Grid Connection Watercourse/Culvert Crossings

The cable route will involve 3 No. bridge crossings including 2 No. HDD crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. The cable will be located within the bridge deck where there is sufficient depth and width available on the bridge, where there is insufficient depth and width available horizontal directional drilling (HDD) may be employed as an alternative.

Bridge 1 crosses over a tributary stream to the Owenmore River on the N59. Sufficient clearance exists within the bridge structure and therefore the bridge can be crossed utilising the ducts in a flat formation method in the bridge deck.

Bridge 2 crosses over a tributary stream to the Owenmore River on the N59. Insufficient clearance exists within the bridge structure and therefore the bridge will be crossed utilising the HDD method. The HDD methodology is outlined in detail in Section 8.6 of Appendix 4-6 of the EIAR.

Bridge 3 is located on the forestry access roadway crossing over a large stream. Bridge 3 has insufficient room to install the cable to the bridge will be crossed utilising the HDD method..

The underground cable will encounter no. 9 culverts along the route. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies.

Existing culverts will be crossed using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. A confirmatory site survey of all culverts has been completed as part of this phase of the project prior to planning to confirm the crossing methods.

The bridge and culvert crossing locations are shown on the grid connection layout drawings in Appendix 4-6 of the EIAR. The detail bridge and culvert crossing methods are detailed in the following drawings in the same appendix:

- Bridge 1: Drawing No. 05796-DR-250
- Bridge 2: Drawing No. 05796-DR-251
- Bridge 3: Drawing No. 05796-DR-252
- Culvert/Service Crossing: 05796-DR-115

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

#### 2.4.12.3.1 *Horizontal Directional Drilling*

It is proposed to implement Horizontal Directional Drilling (HDD) for 2 no. crossings.

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, culverts, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. The proposed HDD methodology, as per Section 8 is as follows: -

- A works area of circa .40 square metres will be fenced on both sides of a crossing
- The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
- The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
- A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
- Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
- The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven and their installed location surveyed.
- The entry and exit pits will be reinstated to the specification of ESB Networks and the Mayo County Council/landowner.

- A transition coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per ESBN and EirGrid requirements, this will join the HDD ducts to the standard ducts.

## 2.4.13 Culvert Crossings on the Wind Farm Site

Culverts will be required where site roads, crane pads and turbine pads cross main forestry drainage networks.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. The use of corrugated surfaces will be confirmed by the Project Ecologist and Project Hydrologist. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance. Any watercourse crossings required will be installed outside of the salmonid spawning season, October to June in any year, in accordance with Inland Fisheries Ireland best practice (IFI, 2016). This will ensure no potential impacts on salmonid spawning habitat.

All of the above works will be supervised by the Environmental Clerk of Works and the project hydrologist.

## 2.4.14 Wind Farm Site Watercourse/Service Crossings

There are a number of natural watercourse and a Gas Networks Ireland pipeline (service) within the site of the Proposed Development.

It is proposed to construct clear-span crossings watercourse/service crossings along the wind farm access roads at 12 no. locations using a bottomless box culvert. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 of this EIAR. The clear-span watercourse/service crossing methodologies presented below will ensure that no instream works are necessary.

The standard construction methodology for the installation of a pre-cast concrete bottomless box culvert crossing is as follows:

- The access road on the approach either side of the watercourse/service will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.–
- All drainage measures along the proposed road will be installed in advance of the works.
- A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. For watercourse crossings, the base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse/service for excavation and foundation installation will require the installation of pre-cast concrete slab across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- Once the foundation base has been completed, the pre-cast concrete box culvert will be installed using a crane which will be set up on the bank of the watercourse/ on the

nearest existing road to the service and will be lifted into place with no contact with the watercourse/service.

- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse,
- ~~O~~Once the crossing is in position stone backfill will be placed and compacted against the structure up to the top of the box culvert above the foundations.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

The service crossings will be constructed in accordance with Gas Networks Ireland *Code of Practice 2021*. These crossing designs will be approved by GNI before works commence on site.

Confirmatory inspections of each proposed new watercourse crossing location will be carried out by the project civil/structural engineer and the project hydrologist prior to the construction of each crossing.

Proposed Mitigation Measures for watercourse crossings are detailed below as detailed in Section 9.3 of the EIAR and are summarised as follows:

- All stream crossings will be bottomless-box or clear span culverts. Existing banks will remain undisturbed.
- Where proposed underground cabling routes follow an existing road or a road proposed for upgrade, cables will pass over or below the culvert within the access road.
- All guidance/mitigation measures proposed by the OPW or IFI are incorporated into the design of proposed crossings.
- As a further precaution, near-stream construction work will only be carried out during the period permitted by IFI for in-stream works according to the guidance document "Guidelines on protection of fisheries during construction works in and adjacent to waters" (IFI, 2016). The relevant period is July to September inclusive, i.e. the typically drier summer period. Any deviation that may be temporarily necessary will be done in discussion with the IFI.
- During near-stream construction works (mainly roads), double-row silt fences will be emplaced immediately downgradient of the construction area for the duration of the construction phase.
- All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

All of the above works will be supervised by the Environmental Clerk of Works and the project hydrologist.

### 2.4.15 Decommissioning

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the Proposed Development will be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB and will form a permanent part of the national electricity grid.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and will be covered with earth and reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Site roadways will be left in situ, for future forestry operations. The amenity and recreation infrastructure will also be left in-situ. Underground cables, including grid connection, will be removed and the ducting left in place.

A Decommissioning Plan has been prepared and included as Appendix 4-7 of the EIAR, which will be agreed with the local authority prior to any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will be agreed with the competent authority at that time. The potential for effects during the decommissioning phase of the proposed renewable energy development have been assessed in the EIAR.

As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*

# 3. ENVIRONMENTAL MANAGEMENT

## 3.1 Introduction

This CEMP includes all best practice measures required to construct the proposed renewable energy development. The drainage proposals will be developed further prior to the commencement of construction however, any such improvements will be in line with the principles set out here and will also be in full compliance with the planning consent and mitigation measures as presented in the EIAR, NIS and all other relevant planning documents. The following sections give an overview of the drainage design, dust and noise control measures and a waste management plan for the site.

While the drainage design measures are presented in Chapter 4 of the EIAR and the drainage management measures and water quality and monitoring measures are included in this CEMP, the Surface Water Management Plan compiles all of these into a single document. The SWMP is an accompanying document for this CEMP and is included as Appendix 4-4 of the EIAR.

## 3.2 Protecting Water Quality

### 3.2.1 Good Environmental Management During Construction

Timing of works can strongly influence the potential for damaging the freshwater environment. Operations during wetter periods of the year pose a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Traditionally, wind farm construction undertaken during the drier summer months will result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones shall be avoided during or after prolonged rainfall or an intense rainfall event and work will cease entirely near watercourses when it is evident that water quality could potentially be impacted. Given that this site has an established drainage network and existing watercourse crossing points, there will be no adverse impacts on watercourses.

### 3.2.2 Site Drainage Principles

The site drainage features have been outlined in Chapter 4, Section 4.7 of the EIAR in addition to the drainage design and management for the Proposed Development. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Development. The Proposed Development's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems.

No routes of any natural drainage features will be altered as part of the Proposed Development. Turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the Proposed Development.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

### 3.2.3 Best Practice Guidance

The drainage design has been prepared based on experience of the project team of other renewable energy sites in peat-dominated environments, and in accordance with a number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farms and other renewable energy developments. However, a selection of good practice approaches have been adopted in preparation of this drainage design, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on forested sites, forest road design, water quality controls for linear projects, forestry road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management all drainage management is prepared in accordance with guidance contained in the following:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads;
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland);
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (September 1996);
- Eastern Regional Fisheries Board: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works Adjacent to Waters;
- Scottish Natural Heritage, 2010: Good Practice During Wind Farm Construction;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA Report No. C648 (2006): CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects';
- CIRIA Report Number C532 (2001): Control of water pollution from construction sites - Guidance for consultants and contractors.; and,
- Control of water pollution from linear construction projects -Technical guidance. CIRIA C648 London, 2006.

## 3.2.4 Site Drainage Design and Management

The proposed site drainage features for this site are outlined in Section 4.7 of the EIAR. The following sections give an outline of drainage management arrangements in terms of pre-construction, construction and operational phases of the Proposed Development.

### 3.2.4.1 Pre-Construction Drainage

There is an existing drainage network across the site. There are two main natural watercourses (with multiple tributaries) which drain the Proposed Development site and there are numerous manmade drains that are in place predominately to drain the forestry plantations This existing drainage system will continue to function as it is during the pre-construction phase.

However, prior to commencement of works in sub-catchments across the site, main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage. It is proposed to complete these inspections on a catchment by catchment basis prior to the commencement of construction works across the site, as works in all areas will not commence simultaneously.

Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off.

### 3.2.4.2 Construction Phase Drainage

The Project Hydrologist will attend the site to set out and assist with the implementation of the proposed drainage controls as outlined in Section 2.5 of the SWMP and shown in the drainage design drawings included with this planning application. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and stilling ponds constructed to eliminate any suspended solids within surface water running off the site.

The implementation of a Scheduling of Works Operating Record (SOWOR) will continue through the construction phase of the project. The SOWOR provides a number of abandonment triggers which will ensure that site management are well informed as to the level of incident that will require the abandonment of works. The various triggers both pre-commencement and abandonment ensure best practice in terms of water quality management is maintained prior to commencement and during the various felling and construction phases.

Best practice and practical experience on other similar projects suggest that in addition to the drainage plans that are included in and as part of this application, there are additional site based decisions that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these are outlined within Section 4 below.

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures, outlined in Sections 2.5 and 3.3 of the SWMP, and to ensure protection of all watercourses.

#### 3.2.4.2.1 *Preparative Site Drainage Management*

All materials and equipment necessary to implement the drainage measures outlined above will be brought on-site in advance of any works commencing.

An adequate quantity of straw bales, clean stone, terram, stakes, etc. will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

#### 3.2.4.2.2 Pre-emptive Site Drainage Management

The works programme for the initial construction stage of the development will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

Using the threshold rainfall values, listed below, will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests either of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures shall be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall (listed above) and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

#### 3.2.4.2.3 Reactive Site Drainage Management

The detailed drainage plan prepared for the site has provided for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat potentially silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) on-site. The ECoW or project hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, following a confirmatory inspection by the project hydrologist, and the modifications will draw on the various features outlined in Section 2.5 of the SWMP in whatever combinations are deemed to be most appropriate to the situation on the ground at a particular time.

In the unlikely event that works are giving rise to siltation of watercourses, the ECoW or project hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures, as outlined in Section 2.5 above, will be installed in advance of works recommencing.

#### 3.2.4.3 Operational Phase Drainage Management

The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work as described below:

- Some interceptor drains will be left in place, upgradient of the proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader.
- Swales/road side drains will remain in place to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to stilling ponds for sediment settling;
- Check dams will be put in place at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Stilling ponds/settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. The stilling ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. Inspection and maintenance of all settlement ponds, along with the entire drainage network, will be ongoing through the construction period.

In the operational phase of the wind farm, the reliance on the drainage system summarised above will become reduced as areas naturally revegetate. Once areas revegetate, this will result in a resumption of the natural drainage management that will have existed prior to any construction.

### 3.2.5 Forestry Felling

Tree felling to facilitate the Proposed Development will commence before the initial construction groundworks on a phased basis across the site.

Water protection measures will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses. These measures are derived from best practice guidance documents as outlined in Section 3.2.3 above. The water protection measures to be adopted during felling operations are set out as follows:

- The extent of all necessary forestry felling areas will be identified and demarcated with markings on the ground in advance of any felling commencing.

- All roads and culverts will be inspected by the ECoW and contractor prior to any machinery being brought on site to commence the felling operation.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt/sediment traps (ie. check dam / silt fence) will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed.
- New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated.
- Sediment removed from traps will be carefully disposed of in the peat repository areas.
- Machine combinations (i.e. hand-held or mechanical) will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance;
- Trees will be cut manually inside the 50m buffer and using machinery to extract whole trees only;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and shall avoid being placed at right angles to the contour;
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion or where felling inside the 50 metre buffer is required, it will be necessary to install double or triple sediment traps.
- Double silt fencing will also be put down slope of felling areas which are located inside the 50 metre buffer zone;
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal shall take place when they become heavily used and worn. Provision shall be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring,

extraction shall be suspended during periods of high rainfall (refer to Section 3.2.4.2.2 above) ;

- Timber will be stacked in dry areas, and outside a local 50 metre watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- No crossing of streams by machinery will be permitted and only travel perpendicular to and away from streams will be allowed;
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, trained personnel will be used where refuelling is required;
- A permit to refuel system will be adopted at the site; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

*Table 3-1 Minimum Buffer Zone Widths (Forest Service, 2000)*

| Average slope leading to the aquatic zone | | Buffer zone width on either side of the aquatic zone | Buffer zone width for highly erodible soils |
|---|---|---|---|
| Moderate | (0 – 15%) | 10 m | 15 m |
| Steep | (15 – 30%) | 15 m | 20 m |
| Very steep | (>30%) | 20 m | 25 m |

### 3.2.5.1 Forestry Felling Drainage Management

Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) shall be appointed to oversee the keyhole and extraction works. The ECoW shall be experienced and competent, and shall have the following functions and operate their record using a Schedule of Works Operation Record (SOWOR), as proposed in the planning application:

- Attend the site for the setup period when drainage protection works are being installed, and be present on site during the remainder of the forestry keyhole felling works.
- Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs), silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below).
- Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works.
- Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness in accordance with Section 3.4 (Monitoring and Recording) and Appendix C (Site Monitoring Form (Visual Inspections)) of the *Forestry & Freshwater Pearl Mussel Requirements.*
- Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures.
- Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:
    - Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations.
    - Sampling shall be taken from the stream / river bank, with no in-stream access permitted.
    - The following minimum analytical suite shall be used:
        - pH,
        - Electrical Conductivity,
        - Temperature
        - Total Suspended Solids, Biochemical Oxygen Demand, Total Phosphorus, Ortho-Phosphate, Total Nitrogen, and Ammonia.
- Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions.
- Prepare and maintain a contingency plan.
- Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.
- Prepare and maintain a Water Protection Measure Register. This document is to be updated weekly by the ECoW.

### 3.2.6 Borrow Pit Drainage

While surface water will be contained in the borrow pits area, the design proposal is to control the level of water in the borrow pit area by creating a single point outlet from the basin-like area that will ensure the water does not overtop the pit area. Run-off from the proposed borrow pit area will be controlled via a single outlet that will be installed at the edge of the borrow pit. The single outfall point will be constructed to manage runoff from the borrow pit and its immediate surrounds. Interceptor drains will already have been installed upgradient of the borrow pit area before any extraction begins.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the single outlet.

### 3.2.7 Peat and Spoil Repository Area Drainage

During the initial placement of peat and subsoil at the repository area, silt fences, straw bales and biodegradable matting will be used to control surface water runoff from the repository area. 'Siltbuster' treatment trains will be employed if previous treatment is not to a high quality.

Drainage from the repository area will ultimately be routed to an oversized swale and a stilling ponds designed for a 24 hour retention time, and for a 1 in 10 year return period, before being discharged to the on-site drains.

The repository area will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised peat/subsoil reinstatement areas will no longer be a potential source of silt laden runoff.

### 3.2.8 Cable Trench Drainage

Cable trenches will be developed in short sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Development, will be transported to one of the peat repository areas, the on-site borrow pit or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 2.5 of the SWMP will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

## 3.3 Refuelling, Fuel and Hazardous Materials

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling shall occur at a controlled fuelling station;
- On-site refuelling will take place using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at

the primary construction compound, via a fuel tanker, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the wind farm. The 4x4 jeep (and all other plant and vehicles on site) will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use. Only designated trained and competent operatives, with a permit to refuel, will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.

- Fuels volumes stored on site shall be minimised. The fuel storage areas, within the temporary construction compounds, will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;
- The electrical substation compound will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- Herbicides, for use in the removal of Rhododendron, will be stored in appropiatley bunded containers at the temporary construction compounds. Further measures are outlined in Section 3.8.1 below.
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be developed (refer to Section 5 of the CEMP). Spill kits will be available to deal with any accidental spillage in and outside the refuelling area.
- Hazardous wastes that may occur on site during the construction phase of the development may include oil, diesel fuel, chemicals, paints, preservatives etc.
- All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility.
- Hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.

## 3.4 Cement Based Products Control Measures

The following mitigation measures will be implemented to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on site;
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout of trucks and discussing emergency procedures.
- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only chute cleaning will be permitted, using the smallest volume of water possible to dedicated impermeable concrete washout area which requires monitoring and maintenance. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed.
- Use weather forecasting to plan dry days for pouring concrete (see Section 3.2.4.2.2);
- The pour site will be free of standing water and plastic covers will be ready in case of sudden rainfall event;

- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, built using straw bales and lined with an impermeable membrane. below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste (refer to Section 3.9 below).

The 50 m wide river buffer zone will be in place for the duration of the construction phase. No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement-based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain discharge outside the 50 m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct pollution of surface waters by any pollutants, or by pollutants entrained in surface water run-off.


*Plate 3-1 Typical concrete chute wash out areas*

## 3.5 Peat Stability Management

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access tracks;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

### 3.5.1 General recommendations for Good Construction

Based on the recommendations and control measures given in the FT Peat Stability Assessment (Appendix 8-1 of the EIAR) report being strictly adhered to during construction and the detailed stability assessment carried out for the peat slopes which showed that the site has an acceptable margin of safety.

The risk assessment at each turbine location identified a number of control measures to further reduce the potential risk of peat failure. Access roads to turbines will be subject to the same relevant control measures that apply to the nearest turbine as detailed in the FT Peat Stability Assessment Report.

The following measures which will be implemented during the construction phase of the project will assist in the management of the risks for this site.

- Appointment of experienced and competent contractors;
- The site will be supervised by experienced and qualified personnel;
- Sufficient time will be allocated for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Undercutting of slopes and unsupported excavations will be prevented.
- A managed robust drainage system will be maintained.
- Placement of loads/overburden on marginal ground will be prevented
- Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment);
- Construction method statements will be developed and agreed before commencement of construction and are followed by the contractor; and,
- The Construction Risk Register will be revised and amended as construction progresses to ensure that risks are managed and controlled for the duration of construction.
- The hydrology of area will be maintained as far as possible by maintaining existing drains to water pressures in the peat to avoid peat becoming "boyant"
- The use of experienced geotechnical staff for site investigations
- The use of experienced contractors and trained operators will carry out the work.
- Detailed ground investigation will determine peat, mineral soil and bedrock condition and properties.
- Potential requirement for small buttress on upslope side of access road to retain peat will be used should any instability be noted.

### 3.5.2 Peat and Spoil Usage in Restoration of the Borrow Pits

The general construction methodology for the construction of the borrow pits is outlined in Section 2.4.4 above. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

### 3.5.3 Peat Placement Areas

The placement of peat and spoil, excavated during the construction phase of the Proposed Development, as presented in Fehily Timoney's Peat & Spoil Management Plan in Appendix 4-2 of the EIAR, is outlined in Section 2.4.5 above. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

## 3.6 Dust Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. soil, sand, peat, etc. and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions. Silty or oily water will not be used for dust suppression.
- Construction traffic will be restricted to defined routes and a speed limit implemented.
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the ECoW for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel washing area prior to entering the local road network.

## 3.7 Noise Control

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the site. The following proposed measures to control noise will be implemented in full include:

- Local residents will be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- Any extraordinary site work occurring outside of the core working hours (for example, crane operations lifting components onto the tower) will be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the site between 19:00 and 07:00, with the exception of abnormal loads that would be scheduled to avoid anticipated periods of high traffic flows;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Inherently quiet plant will be selected where appropriate and available - all major compressors would be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;

- All equipment used on site will be regularly maintained, including maintenance related to noise emissions;
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.

## 3.8 Invasive Species Management

A baseline invasive species survey was carried out at the site to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) by a suitably qualified ecologist. As outlined in Chapter 6 of the EIAR, *Rhododendron ponticum* was recorded from various areas within the site.

### 3.8.1 Removal of Rhododendron

The following treatment procedures will be adhered to facilitate the removal of Rhododendron on site.

- Previously identified infested areas will be resurveyed prior to the commencement of the treatment procedures. The purpose of this is to identify if the Rhododendron has spread outside of previously mapped areas.
- Prior to the commencement of treatment, all areas identified for treatment will be marked with barrier tape.
- All staff will be fully trained and competent in the use of herbicides
- Rhododendron will be cut to a height of between 2 and 4cm above the ground and immediately sprayed with a 20% solution of glyphosate mixed with a dye.
- The application of herbicide will adhere to legislation and best practice protocols on all aspects including: the storage and application of herbicides, PPE, record keeping.
- All herbicide mixtures will be prepared off-site or in a designated area on the forest road network.
- Alternatively eco- plugs may be used. https://www.forestresearch.gov.uk/research/the-use-of-ecoplugs-for-woody-weed-control/
- Treated area will be monitored annually for three years, following the initial treatment. Further cutting and herbicide treatment will be carried out if required.

### 3.8.2 Other Invasive Species

No additional species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 were recorded during the survey. No aquatic invasive species were recorded and no works on or in watercourses are proposed as part of the Croagh Wind Farm development.

In the event that the presence of other such species is found at or adjacent to the development footprint during pre-commencement surveys, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in the following sections.

### 3.8.3 Site Management

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following list of guidelines, which is not exhaustive, shall be followed by all on-site personnel. Only those who have been inducted into biosecurity measures on-site may enter the contaminated zones within the works areas. Should any risk of contaminated material escaping be observed by the site supervisor, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

### 3.8.4 Establish Good Site Hygiene

The following measures are proposed to establish good site hygiene to ensure the control of any potential spread of invasive species during construction works:

- A risk assessment and method statement will be provided by the Contractor prior to commencing works.
- Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.
- A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.
- Stockpile areas will be chosen to minimise movement of contaminated soil.
- Stockpiles will be marked and isolated.
- Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.
- The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.
- An ECoW/suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.

Plant and equipment which is operated within an area for the management of materials in contaminated areas will be decontaminated prior to relocating to a different works area. The decontamination procedures will take account of the following:

- Personnel may only clean down if they are familiar with the plant and rhizome material and can readily identify it.
- Decontamination will only occur within designated wash-down areas.
- Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.
- All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas.

## 3.9 Waste Management

This section of the CEMP provides a waste management plan (WMP) which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Development. Disposal of waste will be seen as a last resort.

## 3.9.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006). It is important to emphasise that no demolition will take place at this site, however, this document was referred to throughout the process of completing this WMP.

## 3.9.2 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

#### Prevention and Minimisation:

The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

#### Reuse of Waste:

Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

#### Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

## 3.9.3 Construction Phase Waste Management

### 3.9.3.1 Description of the Works

The construction of the development will involve the construction of 21 no. turbines, new and upgrade of site access roads, internal cabling and the underground cable route, substation, control buildings and all associated infrastructure.

The turbines will be manufactured off site and delivered to site where on site erection will occur.

The turbine foundations will consist of stone from the onsite borrow pits and a concrete base which will contain reinforcing steel. These concrete foundations will be shuttered with steel formwork specifically designed for the works and re-usable off site on similar projects.

The construction of the extension to the substation will comprise of a concrete foundation with concrete masonry blocks and a timber roof structure with roof tile or slate covering. The roof structure will be made up of prefabricated roof trusses manufactured off site to minimise timber cutting on site.

The site roads will be constructed with rock won from on-site borrow pits

The waste types arising from the construction phase of the development are outlined in Table 3-2 below.

*Table 3-2 Expected waste types arising during the Construction Phase*

| Material Type | Example | EWC Code |
|---|---|---|
| Cables | Electrical wiring | 17 04 11 |
| Cardboard | Boxes, cartons | 15 01 01 |
| Composite packaging | Containers | 15 01 05 |
| Metals | Copper, aluminium, lead, iron and steel | 17 04 07 |
| Inert materials | Sand, stones, plaster, rock, blocks | 17 01 07 |
| Mixed municipal waste | Daily canteen waste from construction workers, miscellaneous | 20 03 01 |
| Plastic | PVC frames, electrical fittings | 17 02 03 |
| Plastic packaging | Packaging with new materials | 15 01 02 |
| Tiles and ceramics | Slates and tiles | 17 01 03 |
| Wooden packaging | Boxes, pallets | 15 01 03 |

Hazardous wastes that may occur on site during the construction phase of the development may include oil, diesel fuel, chemicals, paints, preservatives etc. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. As mentioned above, hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.

#### 3.9.3.2 Waste Arising and Proposals for Minimisation, Refuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures will be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials will be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

#### 3.9.3.3 Waste Arising from Construction Activities

All waste generated on site will be contained in waste skips at a waste storage area on site. This waste storage area will be kept tidy with skips clearly labelled to indicate the allowable material to be disposed of therein.

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation at the wind farm site. Therefore, all wastes streams generated on site will be deposited into a single waste skip. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.

The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited into the on-site skips and subsequently transferred to the MRF.

It is not envisaged that there will be any waste material arising from the materials used to construct the site roads as only the quantity of stone necessary will be sourced from local quarries and brought on site on an 'as needed' basis.

Site personnel will be instructed at induction that under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

### 3.9.4 Waste Arising from Decommissioning

The design life of the proposed renewable energy development is 35 years after which time a decision will be made to determine whether or not the turbines will be replaced by new turbines or if decommissioning will occur. The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time will be infrastructural material such as the turbine foundations, turbines and the granular material used to construct roads. When the site is decommissioned, cranes will disassemble each turbine tower and all equipment. The associated components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the development are outlined in Table 3-3 below.

*Table 3-3 Expected waste types arising during the Decommissioning Phase*

| Material Type | Example | EWC Code |
|---|---|---|
| Cables | Electrical wiring | 17 04 11 |
| Metals | Copper, aluminium, lead, iron and rebar | 17 04 07 |
| Inert materials | Crushed stone, concrete | 17 01 07 |

#### 3.9.4.1 Reuse

Many construction materials will be reused a number of times before they have to be disposed of:

- Concrete will be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. will be used to cover materials on site or reused for the delivery of other materials.
- Excavated material will be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

#### 3.9.4.2 Recycling

If a certain type of construction material cannot be reused onsite, then recycling is the most suitable option. The opportunity for recycling on site will be restricted to the associated packaging from the wind turbines.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The anticipated volume of all waste material to be generated at the development is low which provides the justification for adopting this method of waste management.

### 3.9.5 Implementation

#### 3.9.5.1 Roles and Responsibilities

Prior to the commencement of the development a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

#### 3.9.5.2 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the construction phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and

- Identify and liaise with waste contractors and waste facility operators.

#### 3.9.5.2.1 *Record Keeping*

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

### 3.9.5.3 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed when designing the plan to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

# 4. ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

## 4.1 Roles and Responsibilities

The Site Supervisor/Construction Manager and/or Environmental Clerk of Works (ECoW) are the project focal point relating to construction-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Mayo County Council and other statutory bodies as required.

The ECoW will report directly to the Site Supervisor/Construction Manager. An ECoW, Project Ecologist, Project Hydrologist, Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure provides a "triple lock" review/interaction by external specialists. An organogram structure for the construction stage is as follows:

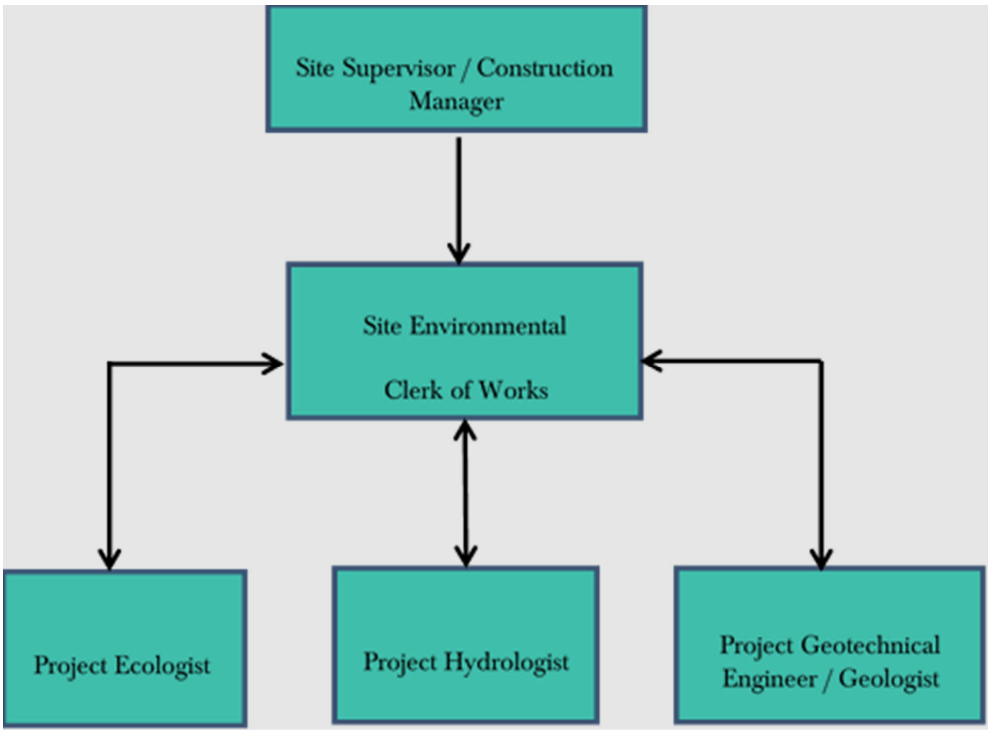


*Figure 4-1 Site Management Chain of Command*

Any requirement of the granted permission, for the works to be supervised by an engineer with professional indemnity insurance, who upon completion of the works, including site stability, shall certify the said works, will be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the project.

### 4.1.1 Construction Manager /Site Supervisor

The Construction Manager / Site Supervisor will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the Project CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;
- Take advice from the Environmental Clerk of Works on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

### 4.1.2 Environmental Clerk of Works

The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Clerk of Works, and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The ECoW will report to the Site Supervisor/Construction Manager. The responsibilities and duties of the ECoW will include the following:

- Preparation and update of the CEMP as required, and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
  - Prevention of environmental pollution and improvement to existing working methods;
  - Changes in legislation and legal requirements affecting the environment;
  - Suitability and use of plant, equipment and materials to prevent pollution;
  - Environmentally sound methods of working and systems to identify environmental hazards;
- Ensure the specified mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist, Project Geotechnical Engineer and any other members of the project team to ensure regular site visits and audits/inspections are completed;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;

- Support the investigation of incidents of significant, potential or actual environmental damage, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and,
- Identify environmental training requirements and arrange relevant training for all levels of site based staff/workers.

The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the project.

### 4.1.3 Project Ecologist

The Project Ecologist will report to the ECoW and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the proposed renewable energy development. The Project Ecologist will not be full time on site but will visit the site at least once a month during construction.

The responsibilities and duties of the Project Ecologist will include the following:

- Review and input to the final construction phase CEMP in respect of ecological matters;
- In liaison with Environmental Clerk of Works, oversee and provide advice on all relevant ecology mitigation measures set out in the EIAR and planning permission conditions;
- Regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required;
- Carry out ecological monitoring and survey work as may be required by the planning authority.

Carry out ecological monitoring and survey work as may be required by the planning authority.

### 4.1.4 Project Hydrologist

The Project Hydrologist will report to the ECoW and is responsible for inspection and review of drainage and water quality aspects associated with construction of the proposed renewable energy development. The Project Hydrologist will not be full time on site but will visit the site at least once a month during construction and on a weekly basis during site preparation/groundworks.

The responsibilities and duties of the Project Hydrologist will include the following:

- Assist in compiling a detailed drainage design before construction commences and attend the site to set out and assist with micro siting of drainage controls. This will be completed over several site visits at the start of the construction phase;
- Review and input to the final construction phase CEMP in respect of drainage and water quality management;
- Following the initial stage of drainage construction regular site visits will be required, at least once a month, to complete hydrological and water quality audits and reviews and report any issues noted to the Site Supervisor/Construction Manager; and,
- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, and in relevant planning conditions.

### 4.1.5 Project Geotechnical Engineer/Geologist

The Geotechnical Engineer or Project Geologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction of the proposed renewable energy development. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during the construction phase and on a weekly basis during site preparation/groundworks.

The responsibilities and duties of the Geotechnical Engineer or Geologist will include the following:

- Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Site Supervisor/Construction Manager;
- Ensuring that identified hazards are listed in the Construction Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of peatland and the temporary stockpile areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, NIS and in relevant planning conditions.

## 4.2 Water Quality and Monitoring

The methodology for water quality monitoring before, during and after the construction phase of the Proposed Development is outlined in detail in Section 4 of the Surface Water Management Plan (SWMP) which is included as Appendix 4-4 of the EIAR.

This document includes details in relation to baseline monitoring, daily visual inspections, continuous monitoring, monthly laboratory analysis, field monitoring and reporting.

# 5. EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

## 5.1 Overview

The Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and suppliers as the project progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

### 5.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Supervisor/Construction Manager will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 5-1. In a situation where the Site Supervisor/ Construction Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 5-1. This will be updated throughout the various stages of the project.

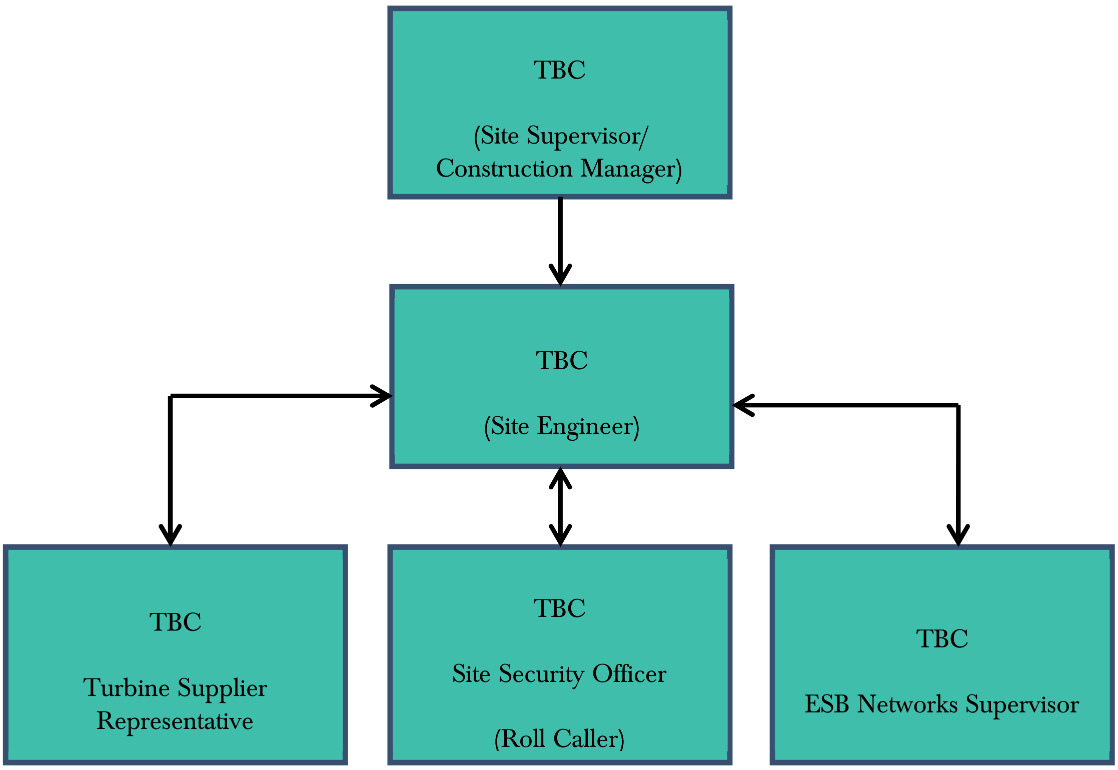


*Figure 5-1 Emergency Response Procedure Chain of Command*

### 5.1.2 Hazard Identification

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

*Table 5-1 Hazards associated with potential emergency situations*

| Hazard | Emergency Situation |
|---|---|
| Construction Vehicles: Dump trucks, tractors, excavators, cranes etc. | Collision or overturn which has resulted in operator or third-party injury. |
| Abrasive wheels/Portable Tools | Entanglement, amputation or electrical shock associated with portable tools |
| Contact with services | Electrical shock or gas leak associated with an accidental breach of underground services |
| Fire | Injury to operative through exposure to fire |
| Falls from heights including falls from scaffold towers, scissor lifts, ladders, roofs and turbines | Injury to operative after a fall from a height |
| Sickness | Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure |
| Turbine Specific Incident | This will be included when the upon agreement and section of the final turbine type |

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 5-1 the Site Supervisor/Construction Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog-horn that activates an emergency evacuation on the site. The Site Supervisor/Construction Manager must proceed to the assembly point if the emergency poses any significant threat to their welfare **and if there are no injured personnel at the scene that require assistance**. The Site Supervisor/Construction Manager will be required to use their own discretion at that point. In the case of fire, the emergency evacuation of the site should proceed, without exception. The site evacuation procedure is outlined in Section 5.1.3.
- Make safe the area if possible and ensure that there is no identifiable risk exists with regard to dealing with the situation e.g. if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone. If delegating the task, ensure that the procedures for contacting the emergency services as set out in Section 5.3 is followed.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g. cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 5.4.
- Contact the next of kin of any injured personnel where appropriate.

### 5.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog-horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills

## 5.2 Environmental Emergency Response Procedure

### 5.2.1 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location, or identified at any location within the site, but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

- All construction activities shall cease within the affected area.
- Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
- Re-commencement of limited construction activity shall only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

### 5.2.2 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

- On alert of a peat slide incident, all construction activities will cease and all available resources will be diverted to assist in the required mitigation procedures.
- Where considered possible action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain, the possible short run-out length to watercourses, speed of movement and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
- For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff

and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

### 5.2.3 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps will be implemented in the event of such an incident:

- The source of the spill will be stopped, and the alarm will be raised to alert people working in the vicinity of any potential dangers.
- If applicable, any sources of ignition will be eliminated in the immediate vicinity of the incident.
- The spill will be contained using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, any vulnerable areas will be covered or bunded off where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Any used spill control material will be contained and disposed of appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- The ECoW will be notified immediately giving information on the location, type, and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Mayo County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident will be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the ECoW will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Mayo County Council, EPA if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

## 5.3 Contact the Emergency Services

In the event of requiring the assistance of the emergency services the following steps will be taken:

**Stay calm**. It is important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

**Know the location of the emergency and the number you are calling from**. This may be asked and answered a couple of times but do not get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for some reason you are disconnected, at least emergency crews will know where to go and how to call you back.

**Wait for the call-taker to ask questions, then answer clearly and calmly**. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

**If you reach a recording, listen to what it says**. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, WAIT. When the next call-taker or dispatcher is available to take the call, it will transfer you.

**Let the call-taker guide the conversation**. He or she is typing the information into a computer and may seem to be taking forever. There is a good chance, however, that emergency services are already being sent while you are still on the line.

**Follow all directions**. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and ask for clarification if you do not understand.

**Keep your eyes open**. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

**Do not hang up the call** until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

## 5.4 Contact Details

A list of emergency contacts is presented in Table 5-2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

*Table 5-2 Emergency Contacts*

| Contact | Telephone no. |
|---|---|
| Emergency Services – Ambulance, Fire, Gardaí | 999/112 |
| Doctor – Bangor Erris Health Centre | (097) 83464 |
| Hospital – Mayo General Hospital | (094) 902 1733 |
| ESB Emergency Services | 1850 372 999 |

| Contact | Telephone no. |
|---|---|
| Gas Networks Ireland Emergency | 1850 20 50 50 |
| Gardaí – Crossmolina Garda Station. | 096 31371 |
| Health and Safety Co-ordinator - Health & Safety Services | TBC |
| Health and Safety Authority | 1890 289 389 |
| Inland Fisheries Ireland (IFI) | 1890 347 424 |
| Project Supervisor Construction Stage (PSCS): TBC | TBC |
| Project Supervisor Design Stage (PSDS): TBC | TBC |
| SSE Renewables Sheskin South Desiganted Acvitiy Company (DAC) | TBC |

### 5.4.1 Procedure for Personal Tracking

All operatives on site without any exception will have to undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

## 5.5 Induction Checklist

Table 5-3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

*Table 5-3 Emergency Response Plan Items Applicable to the Site Induction Process*

| ERP Items to be included in Site Induction | Status |
|---|---|
| All personnel will be made aware of the evacuation procedure during site induction | |
| Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable. | |
| All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin. | |

# 6. MITIGATION MEASURES

All mitigation measures relating to the pre-commencement, construction and operational phases of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR), NIS prepared as part of the planning permission application to An Bord Pleanála.

This section of the CEMP groups together all of the mitigation measures presented in the above documents. The Mitigation Measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits

*Table 6-1 Site Preparation and Mitigation Measures*

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| **EIAR Chapter 4 – Description of the Proposed Development** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM1 | Environmental Management | EIAR Section 4 | All proposed site activities will be provided for in a Construction Environmental Management Plan (CEMP), prepared prior to the commencement of any operations onsite. The CEMP will set out all measures necessary to ensure works are carried out in accordance with the mitigation measures set out in the EIAR and will set out the monitoring and inspections procedures and frequencies. | | |
| MM2 | Environmental Management | EIAR Section 4 | The ECoW will maintain responsibility for monitoring the construction works and audit the implementation of the CEMP. In addition, a Project Ecologist, Project Hydrologist, Project Archaeologist, Project Geotechnical Engineer will visit the site regularly and report to the ECoW. | | |
| MM3 | Environmental Management | CEMP Section 4 | A Site ECoW will oversee the site works and implementation of the Construction Environmental Management Plan (CEMP), and provide on-site advice on the mitigation measures necessary as necessary to ensure the project proceeds as intended. The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by parties where required prior to commencement of construction, and may be further adjusted as required during the course of the project. | | |
| MM4 | Surface Water Quality | CEMP Section 4 | Baseline water quality field testing and laboratory analysis will be undertaken where required prior to commencement of felling and construction at the site. The baseline monitoring programme will be subject to agreement with Donegal County Council. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | Baseline laboratory analysis of a range of parameters with relevant regulatory limits and Environmental Quality Standards (EQSs) will also be undertaken as per water monitoring programme for the Proposed Development and each primary watercourse along the route. | | |
| MM5 | Concrete Deliveries | EIAR Section 4<br><br>CEMP Section 3 | The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout of trucks and discussing emergency procedures. | | |
| MM6 | Site Drainage Plan | EIAR Section 4<br><br>CEMP Section 4 | The Project Hydrologist will prepare detailed drainage design before construction commences. | | |
| MM7 | Preparative Site Drainage Management, | EIAR Section 4<br><br>CEMP Section 4 | The detailed drainage design will specify all materials and equipment necessary to implement the drainage measures effectively, which will be brought on site in advance of any works commencing.<br><br>An adequate quantity of straw bales, clean stone, terram, stakes, etc. will be kept on site at all times to implement the detailed drainage design measures as necessary. The detailed drainage measures will be installed prior to, or at the same time as the works they are intended to drain. | | |
| MM8 | Drainage Inspection | CEMP Section 3 | Prior to commencement of works in sub-catchments across the site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| MM9 | Drainage Maintenance | EIAR Section 4<br><br>CEMP Section 4 | An inspection and maintenance plan for the drainage system on site will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the site ECoW or the Project Hydrologist. | | |
| MM10 | Earthworks | CEMP Section 3 | Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible, drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off. | | |
| MM11 | Felling | EIAR Section 4, 7 | Construction will not commence during the Breeding Bird season from March to August inclusive.<br><br>If breeding activity is identified, the nest site will be located, and no works shall be undertaken within a 500m buffer (Forestry Commission Scotland 2006; Ruddock & Whitfield 2007). No works shall be permitted within the buffer until it can be demonstrated that the nest is no longer occupied. | | |
| MM12 | Felling Licence | EIAR Section 4 | Felling will be carried out under the terms of a licence application to the Forest Service, as per the Forest Service's policy on granting felling licenses for wind farm developments. | | |
| MM13 | Peat Management | EIAR Section 4<br><br>CEMP Section 4 | ▪ Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 1.5m.<br>▪ Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| MM14 | Wastewater Management | EIAR Section 4<br><br>CEMP Section 2 | The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the site's turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007(as amended), will be employed to transport wastewater away from the site. | | |
| MM15 | Refuelling | EIAR Section 4<br><br>CEMP Section 3 | › On-site refuelling will be carried out using a mobile double skinned, bunded fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the Proposed Development. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction when not in use. Refuelling operations will be carried out only by designated trained and competent operatives. Mobile anti-pollution measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.<br>› Fuels stored on site will be minimised. Storage areas where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;<br>› The plant used during construction will be regularly inspected for leaks and fitness for purpose; | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | An emergency plan for the construction phase to deal with accidental spillages is contained within section 5 of the CEMP. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. | | |
| MM16 | Plant and Equipment Inspections | CEMP Section 3 | A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the construction phase. | | |
| MM17 | Concrete Deliveries and Management | EIAR Section 4<br><br>CEMP Section 3 | The following mitigation measures will be implemented to avoid release of cement leachate from the site:<br>▪ No batching of wet-cement products will occur on site;<br>▪ The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout of trucks and discussing emergency procedures.<br>▪ Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;<br>▪ No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;<br>▪ Where concrete is delivered on site, only chute cleaning will be permitted, using the smallest volume of water possible to dedicated impermeable concrete washout area which requires monitoring and maintenance. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed.<br>▪ Use weather forecasting to plan dry days for pouring concrete (see Section 3.2.4.2.2); | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | ▪ The pour site will be free of standing water and plastic covers will be ready in case of sudden rainfall event;<br><br>The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, built using straw bales and lined with an impermeable membrane. below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste | | |
| MM18 | Road Cleanliness | EIAR Section 4.<br><br>CEMP Section 3 | A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the Proposed Development. | | |
| MM19 | Watercourse Buffers | EIAR Section 4.<br><br>CEMP Section 3 | All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. | | |
| MM20 | Water Discharge | EIAR Section 4 | There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. | | |
| MM21 | Wastewater Management | EIAR Section 4. | During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor as required and will be removed from the site on completion of the construction phase. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | CEMP Section 3 | | | |
| MM22 | Drainage Swales | EIAR Section 4<br><br>CEMP Section 3 | Swales will be used to intercept and collect run off from construction areas of the site during the construction phase, and channel it to settlement ponds for sediment attenuation as per the drainage design. | | |
| MM23 | Interceptor Drains | EIAR Section 4<br><br>CEMP Section 3 | Interceptor drains will be installed up-gradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site. It will then be directed to areas where it can be re-distributed over the ground as sheet flow as per the drainage design. | | |
| MM24 | Check Dams | EIAR Section 4<br><br>CEMP Section 3 | Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be installed at regular intervals along interceptor drains to restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam as per the drainage design. | | |
| MM25 | Level Spreaders, | EIAR Section 4<br><br>CEMP Section 3 | A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site. | | |
| MM26 | Piped Slope Drains | EIAR Section 4 | Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders and will only remain in place for the duration of the construction phase. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| MM27 | Vegetation Filters | EIAR Section 4 | Vegetation filters, that is areas of existing vegetation, accepting drainage water issuing from level spreaders as sheet flow, will remove any suspended sediment from water channelled via interceptor drains or any remaining sediment in waters channelled via swales and settlement ponds. | | |
| MM28 | Settlement Ponds | EIAR Section 4<br><br>CEMP Section 3 | Settlement ponds, placed either singly or a pair in series, will buffer volumes of run-off discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to water courses as per the drainage design. | | |
| MM29 | Dewatering Silt Bag | EIAR Section 4<br><br>CEMP Section 3 | Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats - Sediment entrapment mats, consisting of coir or jute matting - will be placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure. | | |
| MM30 | Siltbuster | EIAR Section 4 | A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas if necessary, prior to its discharge to stilling ponds or swales. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. | | |
| MM31 | Culvert Upgrades | EIAR Section 4 | The following mitigation is proposed for completion of wind farm culvert upgrades:<br>› Where possible pre-cast elements for culverts and concrete works will be used;<br>› All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse;<br>› In all cases, culverts will be oversized to allow mammals to pass through the culvert. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | - Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water.<br>- All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance<br>- All proposed new stream crossings will be bottomless or clear span culverts and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the stream at the proposed crossing location;<br>- Where the proposed underground cabling route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road;<br>- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed crossings;<br>- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);<br>- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and, | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | - All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent. | | |
| MM32 | Silt Fences | EIAR Section 4 | - Silt fences will be emplaced within drains down-gradient of all construction areas.<br>- They will remain in place throughout the entire construction phase.<br>- Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading.<br>- The silt fence designs follow the technical guidance document 'Control of Water Pollution from Linear Construction Projects' published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.<br>- All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.<br>- Silt fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it | | |
| MM33 | Sedimats | EIAR Section 4 | - Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure | | |
| MM34 | Hydrocarbon Interceptors | EIAR Section 4 | - A suitably sized hydrocarbon interceptor will be installed wherever it is intended to store hydrocarbons and oils (i.e construction compounds and substation compound) or where it is proposed to park vehicles during the construction and operational phases of the proposed development (i.e construction compounds, substation compound and visitor car park). | | |
| MM35 | Excavation seepages and treatment | EIAR Section 4, | - Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;<br>- If required, pumping of excavation inflows will prevent build-up of water in the excavation;<br>- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters; | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | › The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, along with use of more specialist treatment systems such as a Siltbags;<br>› There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;<br>› Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;<br>› Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through stilling ponds and buffered outfalls onto vegetated surfaces;<br>› Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site; and,<br>Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface | | |
| MM36 | Peat Management | EIAR Section 4<br><br>CEMP Section 4 | ▪ Excavation will take place to a competent stratum beneath the peat.<br>▪ Road construction will be carried out in sections of approximately 50m lengths i.e., no more than 50m of access road should be excavated without re-placement with stone fill.<br>▪ Once excavated, peat will be placed within the borrow pit or the peat and spoil repository.<br>▪ Excavation of materials with respect to control of peat stability.<br>○ Acrotelm (top about 0.3 to 0.4m of peat) is generally required for landscaping and will be stripped and | | |

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| | | | temporarily stockpiled for re-use as required. Acrotelm stripping will be undertaken prior to main excavations.<br>○ Where possible, the acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.<br>○ All catotelm peat (peat below about 0.3 to 0.4m depth) will be transported immediately on excavation to the borrow pit or to the designated peat repository.<br>▪ Side slopes in peat will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.<br>▪ The excavated access road will be constructed of up to 1000mm of selected granular fill. Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works.<br>▪ A layer of geogrid/geotextile may be required at the surface of the competent stratum should excessive rutting be noted in the track.<br>▪ At transitions between floating and excavated roads a length of road of about 10 to 20m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded so that the road surface transitions smoothly from floating to excavated road.<br>▪ Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e., greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contour sit is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method | | |

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| | | | avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.<br>▪ A final surface layer will be placed over the excavated road and will be graded to accommodate wind turbine construction and delivery traffic. | | |
| MM37 | Peat and Spoil Placement Areas | EIAR Section 4.<br><br>CEMP Section 3 | The following measures which will be implemented during the construction phase of the project will assist in the management of the risks for this site.<br>▪ Appointment of experienced and competent contractors;<br>▪ The site will be supervised by experienced and qualified personnel;<br>▪ Sufficient time will be allocated for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);<br>▪ Undercutting of slopes and unsupported excavations will be prevented.<br>▪ A managed robust drainage system will be maintained.<br>▪ Placement of loads/overburden on marginal ground will be prevented<br>▪ Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment);<br>▪ Construction method statements will be developed and agreed before commencement of construction and are followed by the contractor; and,<br>▪ The Construction Risk Register will be revised and amended as construction progresses to ensure that risks are managed and controlled for the duration of construction.<br>▪ The hydrology of area will be maintained as far as possible by maintaining existing drains to water pressures in the peat to avoid peat becoming “boyant”<br>▪ The use of experienced geotechnical staff for site investigations | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | ▪ The use of experienced contractors and trained operators will carry out the work.<br>▪ Detailed ground investigation will determine peat, mineral soil and bedrock condition and properties.<br>▪ Potential requirement for small buttress on upslope side of access road to retain peat will be used should any instability be noted. | | |
| **Operational Phase** | | | | | |
| MM38 | Wastewater Management | EIAR Section 4 | The removal and disposal of wastewater from the site will be carried out by a fully permitted waste collector holding valid Waste Collection Permits as issued under the Waste Management (Collection Permit) Regulations, 2007. | | |
| MM39 | Electrical Substation | EIAR Section 4,<br><br>CEMP Section | The electrical substation will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor. | | |
| | | | **Decommissioning Phase** | | |
| MM40 | Decommissioning | EIAR Chapter 4 | Prior to the end of the operational period the Decommissioning Plan (Appendix 4-6 of the EIAR) will be updated in line with decommissioning methodologies that may exist at the time and will agreed with the competent authority at that time. | | |
| MM41 | Decommissioning | EIAR Chapter 4 | On removal of turbines, the covering of the foundation will be completed using locally sourced material imported to site as the required quantity of material does not currently exist at the site. The imported soil will be spread and graded over the | | |

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| | | DP Section 2 | foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation. | | |
| MM42 | Decommissioning | EIAR Chapter 4<br><br>DP Section 3 | The following mitigation measures are proposed to avoid release of hydrocarbons at the site:<br>- Road-going vehicles will be refuelled off site wherever possible;<br>- On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required<br>- Only designated trained and competent operatives will be authorised to refuel plant on site.<br>- Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately;<br>- The plant used will be regularly inspected for leaks and fitness for purpose; and,<br>- An emergency plan for the decommissioning phase to deal with accidental spillages will be developed (refer to EIAR Section 4). Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.<br><br>A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase. | | |
| MM43 | Decommissioning | EIAR Chapter 4 | Upon completion of the Proposed Development the temporary construction compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required. | | |

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| **Chapter 5: Human Beings** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM44 | Human Health | EIAR Section 5 | Prior to commencement of any works, the occupants of dwellings in the vicinity of the proposed works will be contacted and the scheduling of works will be identified in line with the engagement plan. Local access to properties will also be maintained throughout any construction works and local residents will also be supplied with the number of the works supervisor in order to ensure that disruption will be kept to a minimum. | | |
| **Construction Phase** | | | | | |
| MM45 | Human Health | EIAR Section 5 | The Proposed Development will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including:<br>▪ Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005);<br>▪ Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016);<br>▪ S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021 and<br>▪ Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006).<br><br>A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. | | |
| MM46 | Human Health | EIAR Section 5 | Signage indicating the designated pedestrian route site along the Western Way will be in place during the construction phase of the development. Likewise, appropriate construction site warning signage and health and safety signage will be in place along the Western Way and on the approach to the construction site at all times during the | | |

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| | | | construction phase to ensure that any potential impacts pertaining to existing amenity access is mitigated against. Furthermore, all health and safety procedures as detailed in section 5.10.2.1 will be strictly adhered to ensure not only the safety of construction staff but any users of the Western Way during the construction phase. | | |
| MM47 | Human Health | EIAR Section 5 | - Local residents will be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;<br>- The core hours for construction activity will be 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 Saturday. There will be no working on Sundays and Public Holidays;<br>- Any extraordinary site work occurring outside of the core working hours (for example, crane operations lifting components onto the tower) will be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the site between 19:00 and 07:00, with the exception of abnormal loads that would be scheduled to avoid anticipated periods of high traffic flows;<br>- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;<br>- Inherently quiet plant will be selected where appropriate and available - all major compressors would be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;<br>- All ancillary pneumatic percussive tools will b e fitted with mufflers or silencers of the type recommended by the manufacturers;<br>- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;<br>- All equipment used on site will be regularly maintained, including maintenance related to noise emissions;<br>- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and | | |

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| | | | - All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided. | | |
| **Operational Phase** | | | | | |
| MM48 | Human Health | EIAR Section 5 | - Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits.<br>- Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed or are becoming hidden by vegetation or foliage, with prompt action taken as necessary.<br>- Signs will also be erected at suitable locations across the site as required for the ease and safety of operation of the proposed renewable energy development. These signs include:<br>o Buried cable route markers at 50m (maximum) intervals and change of cable route direction;<br>o Directions to relevant turbines at junctions;<br>o "No access to Unauthorised Personnel" at appropriate locations;<br>o Speed limits signs at site entrance and junctions;<br>o "Warning these Premises are alarmed" at appropriate locations;<br>o "Danger HV" at appropriate locations;<br>o "Warning – Keep clear of structures during electrical storms, high winds or ice conditions" at site entrance;<br>o "No unauthorised vehicles beyond this point" at specific site entrances; and<br>o Other operational signage required as per site-specific hazards.<br>An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the site and providing for access for emergency services at all times | | |

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| MM49 | Shadow Flicker | EIAR Section 5 | Where daily shadow flicker exceedances have been predicted at buildings by the modelling software, a site visit will be undertaken firstly to determine the level of occurrence, existing screening and window orientation.<br><br>**Screening Measures**<br><br>In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at a residential receptor, mitigation options will be discussed with the affected homeowner, including:<br>▪ Installation of appropriate window blinds in the affected rooms of the residence;<br>▪ Planting of screening vegetation;<br>▪ Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation.<br><br>If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator.<br><br>**Wind Turbine Control Measures**<br><br>If it is not possible to mitigate any identified shadow flicker limit exceedance locally using the measures detailed above, wind turbine control measures will be implemented.<br><br>The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to ensure that shadow flickers occurrences at properties which are not naturally screened or cannot be screened with measures outlined above | | |

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| **Chapter 6: Biodiversity** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM50 | Invasive Species Management | EIAR Section 6<br><br>CEMP Section 3 | A pre-construction invasive species survey will be undertaken a part of the proposed project. This will provide updated data in advance of any construction given the intervention time period between the original survey work and any future grant of permission/ construction. Measures will be in place to prevent the spread of these species during the proposed works. In addition, all necessary precautions will be taken to prevent the introduction of invasive species to the site from elsewhere. | | |
| MM51 | Fauna | EIAR Section 6 | ▪ A pre-construction badger survey will be undertaken at the location of the identified sett by a qualified ecologist prior to the commencement of any works to determine if the setts are in use and to identify any additional sett entrances that may have been excavated in the intervening period.<br>▪ The sett will be monitored for 2 weeks prior to construction using a camera trap to determine if it is in use.<br>▪ If the sett is found to be in use exclusion measures will be put in place prior to construction in line with NRA Guidelines to ensure that the sett is evacuated.<br>▪ As per NRA guidelines Exclusion from an active sett will only be carried out during the period of July to November inclusive in order to avoid the badger breeding season.<br>▪ During the breeding season (December to June inclusive) no works will be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.<br>▪ Exclusion zone fencing and appropriate signage will be put in place around the main sett to the south of the substation which lies outside the construction footprint. This will ensure that there | | |

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| | | | will be no vehicles tracking in the area and no temporary storage of construction materials that could impact the sett. | | |
| MM52 | Fauna | EIAR Section 6 | ▪ From a precautionary basis, a pre-commencement otter survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works.<br>▪ Should the surveys identify the presence of an otter holt, the following measures will be undertaken a National Parks and Wildlife Service and a derogation licence will be applied for (although compliance with such a licence has not been relied on in this assessment).<br>▪ No works will be undertaken within 150m of any holts at which breeding females or cubs are present.<br>▪ No wheeled or tracked vehicles (of any kind) should be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance should also not take place within 15m of such holts, except under licence (TII, 2008b). | | |
| MM53 | Bats | Appendix 6-2 | NatureScot recommends that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post construction monitoring. | | |
| **Construction Phase** | | | | | |
| MM54 | Bats | EIAR Section 6<br><br>Appendix 6-2 | ▪ Plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).<br>▪ Exterior lighting, during construction, will be designed to minimize light spillage, thus reducing the effect on areas outside the Proposed Development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around | | |

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| | | | the periphery of the site boundary to minimize disturbance to bats. Directional accessories can be used to direct light away from these features, e.g. through the use of light shields (Stone, 2013). The luminaries will be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands. | | |
| MM55 | Invasive Species | EIAR Section 6 | ▪ The treatment of Rhododendron is fully described in section 2.2 of the Biodiversity Management and Enhancement Plan (BMEP), available in appendix 6-5.<br>▪ Previously identified infested areas will be resurveyed prior to the commencement of the treatment procedures. The purpose of this is to identify if the Rhododendron has spread outside of previously mapped areas.<br>▪ Prior to the commencement of treatment, all areas identified for treatment will be marked with barrier tape.<br>▪ All staff will be fully trained and competent in the use of herbicides<br>▪ Rhododendron will be cut to a height of between 2 and 4cm above the ground and immediately sprayed with a 20% solution of glyphosate mixed with a dye.<br>▪ The application of herbicide will adhere to legislation and best practice protocols on all aspects including: the storage and application of herbicides, PPE, record keeping.<br>▪ All herbicide mixtures will be prepared off-site or in a designated area on the forest road network.<br>▪ Alternatively eco- plugs may be used. https://www.forestresearch.gov.uk/research/the-use-of-ecoplugs-for-woody-weed-control/<br>▪ Treated area will be monitored annually for three years, following the initial treatment. Further cutting and herbicide treatment will be carried out if required | | |

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| | | | ▪ Good construction site hygiene will be employed to prevent the spread and introduction of problematic invasive alien plant species (e.g. Japanese knotweed, Rhododendron, Giant Rhubarb etc.) by thoroughly washing vehicles prior to entering the site.<br>▪ Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present. | | |
| MM56 | Aquatic Fauna | EIAR Section 6 | In relation to new watercourse crossings, Inland Fisheries Ireland (IFI) will be consulted a minimum of four weeks in advance of the installation of pre-cast concrete bottomless box culverts. The Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters; and the Scottish Natural Heritage (SNH) Good Practice During Wind Farm Construction (SNH, 2019, 4th Edition) will also be adhered to. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI). | | |
| MM57 | Invasive Species | EIAR Section 6<br><br>CEMP Section 3 | The following measures are proposed to establish good site hygiene to ensure the control of any potential spread of invasive species during construction works, if they are identified prior to the commencement of the construction phase:<br>▪ A risk assessment and method statement must be provided by the Contractor prior to commencing works.<br>▪ Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.<br>▪ A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.<br>▪ Stockpile areas will be chosen to minimise movement of contaminated soil.<br>▪ Stockpiles will be marked and isolated. | | |

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| | | | ▪ Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.<br>▪ The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.<br>▪ An ECoW/suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.<br>▪ Plant and equipment which is operated within an area for the management of materials in contaminated areas should be decontaminated prior to relocating to a different works area. The decontamination procedures should take account of the following:<br>▪ Personnel may only clean down if they are familiar with the plant and rhizome material and can readily identify it.<br>▪ Decontamination will only occur within designated wash-down areas.<br>▪ Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.<br>▪ All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas. | | |

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| MM58 | Flora and Fauna | EIAR Section 6 | The Proposed Development has the potential to result in enhancement of the surrounding areas through habitat rehabilitation management (as described in the Biodiversity and Enhancement Management Plan) that will be implemented during the construction phase of the Proposed Development and maintained during the operational phase. Details of the management that will be undertaken are provided in the Biodiversity and Enhancement Management Plan in Appendix 6-4 of the EIAR. These include:<br>- Conifer Felling<br>- Drain Blocking<br>- Vegetation Monitoring<br>- Hydrological Monitoring | | |
| **Operational Phase** | | | | | |
| MM59 | Bats | EIAR Section 6<br><br>Appendix 6-2 | In order to reduce the value of the habitat for bat species in the areas surrounding the turbines, a buffer of at least 50m between the tip of the blade and any trees or other tall vegetation that could provide high quality foraging habitat for bat species will be implemented. A full description of the mitigation measures proposed during operational phase are described in section 6.1 of the Bat report. Details of this mitigation and how it is calculated is provided in Appendix 6-2.<br><br>**Blade Feathering**<br><br>On a precautionary basis, and in addition to buffers applied to habitat features, it is proposed that all wind turbines are subject to 'feathering' of turbine blades when wind speeds are below the cut-in speed of the proposed turbine. This means that the turbine blades are pitched at 90 degrees or parallel to the wind to reduce their rotation speed to below two revolutions per minute while idling. This measure has | | |

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| | | | been shown to significantly reduce bat fatalities (by up to 50%) in some studies (NIEA, 2021).<br><br>**Bat Mitigation and Monitoring Plan**<br><br>Full details of the proposed operational bat monitoring programme for the Proposed Development are provided in Section 6.2.1 of the Bat Report (Appendix 6-2)<br>▪ The post-construction surveys will be carried out as per the pre-construction survey effort. Post-construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision.<br>▪ Static monitoring shall take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021).<br>▪ Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with NIEA Guidance. This shall include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality.<br><br>Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the preceding year(s). | | |
| **Decommissioning Phase** | | | | | |

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| MM60 | Decommissioning | EIAR Section 6 | The same mitigation to prevent significant impacts on water quality and associated aquatic fauna and other terrestrial fauna during construction will be applicable to the decommissioning phase. An outline decommissioning plan is contained in the CEMP, Appendix 4-4 of the EIAR. The CEMP for the project provides the details of the mitigation and best practice that will be employed to avoid any potential for significant residual effects on biodiversity during decommissioning of the proposed wind farm. | | |
| **Chapter 7 Birds (Appendix 7-1)** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM61 | Birds | Appendix 7-1 | During the breeding season (March-August) bird monitoring surveys within the Proposed Development site will take place to a distance of 500 m from the development area. However, for the bogs to the west of site, the survey that was carried out in 2022 will be repeated, with transects up to 1,000 m from the edge of the forest. | | |
| MM62 | Birds | Appendix 7-1 | It is noted that the wet bog to the southwest and south of the site had not been included in the 2022 survey for health and safety reasons –. The assumption has been made that sensitive breeding species may be present (as habitat is certainly suitable to support same) and a restrictive zone of 500 m from the forest/bog edge will be implemented during the breeding season as a precautionary measure.<br><br>The survey for breeding birds on the bog (following Brown and Shepherd 1993) will take place in the April to July period (4 visits) in the season before works, | | |

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| | | | including tree felling, commence. This schedule will provide guidance to the contractor on where restrictive zones are likely to be required. | | |
| **Construction Phase** | | | | | |
| MM63 | Birds | Appendix 7-1 | Should any of these species be recorded breeding within the given distances of the works area (as established through confirmatory surveys before and/or during construction) a buffer zone (see appendix 7-1) shall be established around the expected location of the nest (location identified as far as is possible without causing disturbance to the bird) and all works will be restricted within the zone until it can be demonstrated by an ornithologist that the species has completed the breeding cycle in the identified area. Any restricted area that is required to be set up will be marked clearly using hazard tape fencing and all site staff will be alerted through toolbox talks.<br><br>The above mitigation, which will apply from March to August (inclusive), will ensure that the works will not have adverse effects on the identified IEFs. | | |
| MM64 | Birds | Appendix 7-1 | Any ground clearance of habitat that could support breeding birds (during period March to August) will be walked to establish the presence of breeding birds (mainly passerines). This will be done by an ornithologist up to 10 days before the clearance works take place. If 10 days elapse without the clearing commencing, a further survey will take place. The focus will be on the area to be cleared but zones up to 100 m (approximately) around the area will also be included. Should a breeding territory be identified, the surveyor will attempt to establish the phase of building, e.g. nest building, incubating, feeding young, and will advise the contractor accordingly on measures to be followed | | |

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| **Operational Phase** | | | | | |
| MM65 | Birds | Appendix 7-1 | Areas of forest around turbines which are cleared of trees will be managed to prevent establishment of scrub and rank vegetation which would encourage small mammals and birds and attract species such as kestrel to hunt near the turbines and increase risk of collision. This maintenance will be carried out on an annual basis by mowing or strimming. | | |
| **Decommissioning Phase** | | | | | |
| MM66 | Birds | Appendix 7-1 | As the decommissioning works will involve works similar to those involved at construction stage, these could result in similar effects on birds. Hence, the mitigation that will be undertaken during construction will also be applied during the decommissioning phase (taking into account changes that may have occurred locally during the operational life of the project). | | |
| **EIAR Chapter 8 Land Soils & Geology** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM67 | Earthworks | EIAR Section 8 | ▪ Placement of turbines and associated infrastructure in areas with shallower peat has been achieved during the design phase;<br>▪ Maximum use of the existing road network to reduce peat excavation and borrow pit volumes;<br>▪ A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume | | |

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| | | | present on the site due to optimisation of the layout by mitigation by design (avoidance of deep peat areas);<br>▪ A suitable drainage system to be constructed to ensure continuity of the site hydrology (EIAR Chapter 9).<br>▪ All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel/rock fill will be used to provide additional support to temporary cuts/excavations where appropriate, as determined by the Project Geotechnical Engineer. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.<br>▪ To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that peatland / soils outside the work area is not damaged. Excavations will then be carried out from access tracks, where possible, as they are constructed in order to reduce the compaction of soft ground.<br>▪ Soil excavated from trenches along the proposed grid connection route will be stored with the borrow pits on the Site. The tarmac / asphalt layers will be taken to a licenced facility for disposal or recycling. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers | | |
| **Construction Phase** | | | | | |
| MM68 | Contamination of Soils | EIAR Section 8 | ▪ Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling will occur at a controlled fuelling station; | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | ▪ On site re-fuelling will be undertaken using a double skinned bowser with spill kits readily available on site for accidental leakages or spillages;<br>▪ On site re-fuelling will be undertaken by suitably trained personnel only under a permit to refuel system;<br>▪ Fuels stored on site will be minimised. Storage areas located at the temporary compounds where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;<br>▪ The electrical substation will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;<br>▪ The plant used during construction will be regularly inspected for leaks and fitness for purpose;<br>▪ All waste tar material arising from the chipping and resurfacing of the public road portion of the temporary construction access road will be removed off-site and taken to licenced waste facility;<br>▪ An emergency plan for the construction phase to deal with accidental spillages is contained within the Construction and Environmental Management Plan (Appendix 4-3 of this EIAR). Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. | | |
| MM69 | Erosion of soils | EIAR Section 8 | To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the exposed soils and bedrock, refuelling of machinery and plant will only occur at designated refuelling areas. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| MM70 | Felling | EIAR Section 8 | During tree felling, brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. | | |
| MM71 | Peat Instability | EIAR Section 8<br>Appendix 8-1 | The following measures which will be implemented during the construction phase of the project will ensure the management of the risks for this site.<br>› Appointment of experienced and competent contractors;<br>› The site will be supervised by experienced and qualified personnel, including a project Geotechnical Engineer;<br>› Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement);<br>› Prevent undercutting of slopes and unsupported excavations. All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel/rock fill will be used to provide additional support to temporary cuts/excavations where appropriate, as determined by the Project Geotechnical Engineer. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.<br>› Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground/peat.<br>› Maintain a managed robust drainage system (see Chapter 4 and 9 of this EIAR for details);<br>› Prevent placement of loads/overburden on marginal ground as detailed in the peat stability assessment report; | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | - Set up, maintain and report findings from monitoring systems (as described in the Peat & Spoil Management Plan, Appendix 4-2);<br>- Where possible , earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability and drainage by the Project Geotechnical Engineer will be carried out on site when a daily rainfall of over 15mm is recorded on site, works will only recommence after heavy rain with the prior approval of the Project Geotechnical Engineer following their inspection.<br>- Engineer and Contractor to ensure that construction method statements are followed; and,<br>Revise the Geotechnical Risk Register, as necessary, as construction progresses to ensure that risks are managed and controlled. | | |
| **Operational Phase** | | | | | |
| MM72 | Soils and Geology | EIAR Section 8 | Mitigation measures for soils and geology during the operational stage include the use of aggregate from local, authorised quarries for use in road and hardstand maintenance. Oil used in transformers (at the substation and within each turbine) and storage of oils in tanks at the substation could leak during the operational phase and impact on ground/peat and subsoils and groundwater or surface water quality. The substation transformer, and oil storage tanks will be in a concrete bund capable of holding 110% of the stored oil volume. Turbine transformers are located within the turbines, so any leaks would be contained within the turbine structure. These mitigation measures are sufficient to reduce risk to ground/peat/soils and subsoils, and groundwater and surface water quality. | | |
| **Decommissioning Phase** | | | | | |
| MM73 | Decommissioning Phase | EIAR Section 8 | Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| **EIAR Chapter 9 Hydrology** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM74 | Clear-felling of Coniferous Plantation | EIAR Section 9 | **Mitigation by Avoidance:** There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines"<br><br>**Mitigation by Design:** Mitigation measures will be implemented wherever clear-felling is planned. The objective will be to mitigate the risk of mobilising suspended solids and nutrients into drains and surface water courses, as follows:<br><br>Small felling areas (<25ha), sequencing of felling to avoid intense felling in one sub catchment.<br>▪ Limiting felling areas and sequencing the felling to avoid intense felling in one subcatchment.<br>▪ Machine combinations (*i.e.* handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance.<br>▪ Sediment/Silt traps will be strategically placed downslope within forestry drains near streams before ground preparation. The purpose is to slow water flow, increase residence time, and allow settling of silt. No direct discharge of such ditches to water courses will occur.<br>▪ Crossing of streams away from bridges and culverts will not be permitted. Checking and maintenance of roads and culverts will be on-going throughout felling activity. No tracking of vehicles through watercourses will occur. Existing interceptor drains will also not be disturbed.<br>▪ Clay, soil and silts will be removed from roads during wet periods and dust will be suppressed during dry spells. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | ▪ Main drains that accommodate the discharge from collector drains will include rock armour, as required, where there are steep gradients.<br>▪ On steep slopes and where felling inside the 50 metre buffer is required, it will be necessary to install double or triple sediment traps. All drainage channels will taper out before entering the buffer zone. This ensures that discharged water fans out over the buffer zone before entering the aquatic zone, with sediment filtered out by ground vegetation within the zone.<br>▪ Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in dedicated disposal areas.<br>▪ Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled.<br>▪ Brash management/removal.<br>▪ Brash mats will be used to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion, extraction will be suspended during periods of high rainfall.<br>▪ Timber will be stacked in dry areas and outside a 50 metre buffer. Straw bales and check dams will be emplaced on the downgradient side of timber storage/processing sites.<br>▪ Works will not be carried out during significant rainfall events (see Section 9.4.2.2) in order to minimise entrainment of exposed sediment in surface water run-off.<br>▪ Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when tree-felling operations have been completed. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | **Drain Inspection and Maintenance:** The following items will be carried out during pre-felling inspections and after:<br>▪ Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines (*i.e.,* hot spot areas).<br>▪ Inspections of plant and machinery will be carried out prior to any works to assure all are in good condition.<br>▪ Inspection of drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. The pre-felling inspection will be carried out during rainfall events.<br>▪ Following tree felling, all main drains will be inspected to ensure that they are functioning.<br>▪ Extraction tracks nears drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; Culverts on drains exiting the site will be unblocked.<br>▪ All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall. | | |
| MM75 | Earthworks | EIAR Section 9 | **Mitigation by Avoidance:** Works areas will be kept at least 50 m from water courses to the extent possible. The proposed setback distance/buffer will serve to avoid:<br>▪ Direct physical damage to watercourses and associated releases of sediment.<br>▪ Direct entry of suspended sediments from earthworks into watercourses.<br>▪ Direct entry of suspended sediments from the drainage system into watercourses, which is achieved in part by ending drain discharges outside the buffer and allowing percolation across the vegetation within the buffer. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | Risks and effects of earthworks are made greater during storm events. Hence, earthworks will not be carried out during significant storm events. The works programme for the entire construction stage of the development will take account of weather forecasts, notably predicted rainfall. Large excavations and movements of soil/subsoil or vegetation stripping will be scaled back or suspended if heavy rain is forecast. Threshold rainfall values will serve to guide decisions to suspend works, visually and/or judged from weather forecasting, by either of the following:<br>▪ High-intensity rainfall events, >10 mm/hr.<br>▪ Heavy frontal rainfall lasting most of the day, >25 mm in a 24-hour period.<br>▪ More than half the monthly average rainfall over 7 days.<br><br>The checking and communication of weather forecasts are part of the CEMP. Prior to suspending works for climatic reasons, the following control measures will be completed:<br>▪ Open excavations will be secured.<br>▪ Temporary or emergency drainage will be provided to prevent back-up of surface runoff in work areas.<br>▪ Working for up to 12 hours after heavy rainfall events will be avoided to ensure drainage systems are not overloaded. Decisions are subject to visual inspection and judgement by the resident (supervising) engineer. The intent and objective is to control erosion, avoid collapses of embankments, and limit the mobilisation and transport of sediments.<br><br>**Mitigation by Design:** Key mitigation by design measures that will be implemented comprise source controls, in-line controls and treatment systems, as follows:<br>▪ Source control measures cover working areas, staging areas and stockpiles. Methods that will be employed are diversion drains, flume pipes, sand bags, oyster bags filled with gravel, and filter fabrics. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | Flexibility to adapt methods will be required based on location-specific conditions, as judged by supervising engineers from visual inspection.<br>▪ In-Line controls involve settling of suspended sediments and particulate organic matter with the use of silt fences, straw bales, sand or oyster bags, weirs, baffles, and check dams. Flow limiters and sump pumping systems may be employed where needs arise in order to maintain the hydraulic functioning of the existing drain system.<br>▪ Treatment systems involve sediment traps and temporary sumps/attenuation ponds. | | |
| MM76 | Site Drainage Management | EIAR Section 9<br><br>CEMP Section 3 | The works programme for the entire construction stage of the development will take account of weather forecasts and predicted rainfall. Large excavations and movements of soil/subsoil or vegetation stripping will be scaled back or suspended if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount and intensity of rainfall that is forecast. The following relevant forecasting systems are available and will be relied on for said purpose, on a daily basis:<br><br>› General Weather Forecasts: Available from national to county level from Met Éireann (www.met.ie/forecasts). These do not provide quantitative rainfall estimates.<br>› 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events.<br>› Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are sequenced but not predictive.<br>› Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | weather data and give the best available forecast for the area of interest.<br><br>Using threshold rainfall values will allow work to be safely controlled from a water management and protection perspective. Works will be suspended if forecasting suggests either of the following is likely to occur:<br><br>- >10 mm/hr (i.e. high intensity local rainfall events);<br>- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day);<br>- >half monthly average rainfall in any 7 days.<br><br>Prior to works being suspended, the following control measures will be completed:<br>- Secure all open excavations.<br>- Provide temporary or emergency drainage to prevent back-up of surface runoff.<br>- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded. | | |
| **Construction Phase** | | | | | |
| MM77 | Spills & Leaks | EIAR Section 9<br><br>CEMP Section 3 | Proposed mitigation measures to avoid releases of fuel and other chemicals at the site are:<br>▪ Onsite refuelling will be carried out by trained personnel only.<br>▪ Onsite refuelling of machinery will be done by mobile double-skinned fuel bowsers.<br>▪ Drip trays and fuel absorbent mats will be available and used during all refuelling operations<br>▪ A permit for the fuel system will be put in place. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | ▪ Fuels stored onsite will be minimised. Fuel storage areas will be bunded to contain 110%v of the fuel storage volume for the time period of the construction. Rainwater will not be allowed to accumulate within the bund, and will thus be fitted with a storm drainage system and appropriate oil interceptor.<br>▪ The plant used during construction will be regularly inspected for leaks and fitness for purpose.<br>▪ Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. | | |
| MM78 | Peat & Spoil Placement Areas | EIAR Section 9 | During the initial placement of peat and spoil, silt fences, straw bales and biodegradable matting will be used to control runoff from reinstatement areas. 'Siltbuster' treatment trains will be employed if previous treatment as listed above is not to a high quality.<br><br>Drainage from peat placement areas will ultimately be routed to swales and stilling ponds with storage and settlement designed for a 6-hour duration, 1 in 100 year storm event, before being discharged to the on-site drains.<br><br>Peat and spoil placement areas will be vegetated to reduce sediment entrainment in runoff. Once stabilised, these areas will no longer be a potential source of silt-laden runoff. | | |
| MM79 | Culverting | EIAR Section 9<br><br>CEMP Section 3 | **Mitigation Measures by Avoidance:** Machinery and personnel are kept out of the river directly. Direct in-stream works will be avoided.<br><br>**Mitigation Measures by Design:** All works will be carried out in accordance with the CEMP which incorporates the best practice IFI "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters" (IFI, 2016). | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | Related activity incorporates many of the same measures that are presented in Section 9.4.2.2 (earthworks). Moreover:<br>▪ All stream crossings will be bottomless-box or clear span culverts. Existing banks will remain undisturbed.<br>▪ Where proposed underground cabling routes follow an existing access track or a track proposed for upgrade, cables will pass over or below the culvert.<br>▪ Based on IFI (2016), the relevant work period is July to September inclusive, *i.e.,* the relatively drier summer period. Any deviation that may be temporarily necessary will be done in discussion with the IFI.<br>▪ During near-stream construction works, double-row silt fences will be emplaced immediately downgradient of work areas for the duration of activity.<br>▪ All new stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent. | | |
| MM80 | Directional Drilling | EIAR Section 9 | Mitigation measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling will be implemented in full, as follows:<br>▪ The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages.<br>▪ One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks.<br>▪ Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush | | |
| MM81 | Release of Cement-based Products | EIAR Section 9 | **Mitigation Measures by Avoidance:**<br>▪ Concrete will be delivered in sealed concrete delivery trucks. Batching of wet-cement products will not occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.<br>▪ Pre-cast elements for culverts and concrete works will be used.<br>▪ Concrete trucks will not be washed out on site but will be directed back to their batching plant for washout.<br>**Mitigation Measures by Design:**<br>▪ Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement-contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined Siltbuster-type cement washout ponds, or equivalent (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/)<br>▪ Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. These are covered when not in use to prevent rainwater collecting.<br>▪ Pour sites of cement will be kept free of standing water, and plastic covers will be ready in case of sudden rainfall events.<br><br>Risks of pollution will be further reduced as follows: | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | ▪ Concrete will not be transported around the site in open trailers or dumpers so as to avoid spillage while in transport.<br>▪ All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.<br>▪ Arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.<br>▪ Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.<br>▪ Weather forecasting will be used to assist in planning large concrete pours and large pours will be avoided where prolonged periods of heavy rain is forecast..<br>▪ Concrete pumps and machine buckets from slewing over watercourses will be restricted while placing concrete.<br>▪ Excavations will be sufficiently dewatered before concreting begins and dewatering will continue while concrete sets.<br>▪ Covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain.<br>▪ Any potential, small surplus of concrete will be disposed of after completion of a pour in suitable locations away from any watercourse or sensitive habitats. | | |
| MM82 | Wastewater Management | EIAR Section 9 | Wastewater from staff welfare facilities will be collected and brought offsite for disposal by authorised means to a wastewater treatment plant. The operation makes | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | use of a sealed storage tank and a permitted waste/wastewater collector. Wastewater will not be treated or disposed of onsite. | | |
| MM83 | Pumping from Open Pits | EIAR Section 9 | **Mitigation by Avoidance:** An upslope interceptor drain will be established upslope of the excavation area to prevent greenfield runoff into the excavations. Berms can also be used, as necessary, to keep runoff waters from entering open pits.<br><br>**Mitigation by Design:** The water pumped by sump pumps will pass through silt bags before being discharged into the swale. As the water pass through the silt bags, the majority of sediment and organic matter is retained by geotextile fabric. The silt bags will be used with natural vegetation filters or sedimats. The sedimats will be secured to the ground surface using stakes/pegs. They will extend to the full width of the outfall to ensure that all water passes through this treatment measure. Level spreaders will be installed for each outfall.<br><br>The footprints of excavations for infrastructure foundation works and hardstanding have been planned to be as small as practicable. Excavations will be backfilled after completion of installations, which will serve to restore water levels and drainage patterns, hence reduce the temporary drainage effects. | | |
| MM84 | WFD Water Body Status | EIAR Section 9 | **Mitigation by Design:** Mitigation measures are necessary and proposed to break potential source- receptor linkages and allow for attenuation. The means and methods of achieving the necessary levels of protection are proven and established based on existing guidance and practical experiences from other similar sites.<br><br>Relevant mitigation measures are all of those described in the preceding sections for the construction phase. The Contractor will be legally required to adhere to the CEMP. Extensive monitoring will be undertaken to monitor water quality, identify potential effects, and take corrective action as necessary. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | **Operational Phase** | | |
| MM85 | Maintenance Works | EIAR Section 9<br><br>CEMP Section 3 | **Mitigation by Design:** Maintenance works will be subject to control measures contained in the CEMP. Sediments removed will be staged, transported and disposed offsite at suitable and agreed disposal sites. | | |
| MM86 | Wastewater | EIAR Section 9 | **Mitigation Measures by Avoidance:** Wastewater will not be treated or disposed of onsite. | | |
| | | | **Decommissioning Phase** | | |
| MM87 | Decommissioning | EIAR Section 9 | During decommissioning, it will be possible to reverse or at least reduce some of the potential effects caused during construction, and to a lesser extent operation, by rehabilitating constructed areas such as turbine bases and hardstanding areas. This will be done by re-establishing vegetation, thereby reducing runoff and sediment loads.<br><br>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. With these measures, no significant effects on the hydrological and hydrogeological environment will occur during the decommissioning stage of the proposed development. | | |
| | | | **Chapter 10 Air & Climate** | | |
| | | | **Construction Phase** | | |
| MM88 | Exhaust Emissions | EIAR Section 10 | ▪ All construction vehicles and plant used onsite during the construction phase will be maintained in good operational order. If a vehicle | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | requires repairs this work will be caried out, thereby minimising any emissions that arise.<br>▪ Turbines components will be transported to the Site on specified routes only, unless otherwise agreed with the Planning Authority.<br>▪ All machinery will be switched off when not in use.<br>▪ Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.<br>▪ The majority of aggregate materials for the construction of the Proposed Development will be obtained from the borrow pits on site. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.<br>▪ The MRF facility will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the Wind Farm Site is located approximately 37km to the east of the Wind Farm Site.<br>▪ Waste associated with the construction of the Grid Connection underground electrical cabling route will be disposed of at the closest MRF to where waste is generated along the underground electrical cabling route. There closest licensed waste facilities in the vicinity of the underground electrical cabling route, is located approximately 37km to the east. | | |
| MM89 | Dust Emissions | EIAR Section 10<br><br>CEMP Section 3 | ▪ A wheel wash facility will be installed on the Proposed Development site and will be used by vehicles before leaving site.<br>▪ In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, grid route, road widening sections, substation, and construction compounds and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, such as during periods of dry weather, de-silted water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| | | | or water spreader to dampen down haul roads, turbine bases, borrow pit and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored by the Ecological Clerk of Woks to avoid, insofar as reasonably possible, increased runoff as outlined in the CEMP.<br>▪ Areas of excavation will be kept to a minimum and stockpiling of excavated material will be minimised by coordinating excavation, placement of material in peat placement areas and restoration of borrow pits.<br>▪ Turbines components and construction materials will be transported to the site on specified haul routes only, as agreed with the local authority.<br>▪ The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as deemed necessary by the construction Site Supervisor/Site Manager.<br>▪ The transport of construction materials may have the potential to generate dust in dry weather conditions. Roads will be watered down to suppress dust particles in the air as deemed necessary by the Site Supervisor/Manager.<br>▪ The transport of dry excavated material from the on-site borrow pits, which may have potential to generate dust will be minimised. If necessary, such as in periods of dry weather, excavated material will be dampened prior to transport from the borrow pits.<br>▪ A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase | | |
| **Operational Phase** | | | | | |
| MM90 | Exhaust Emissions | EIAR Section 10 | Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
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| **Decommissioning Phase** | | | | | |
| MM91 | Decommissioning Phase | EIAR Section 10 | The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts. | | |
| **EIAR Chapter 11 Noise** | | | | | |
| **Pre-Commencement Phase** | | | | | |
| MM92 | Construction Noise | EIAR Section 11 | Local residents will be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern; | | |
| **Construction Phase** | | | | | |
| MM93 | Construction Noise | EIAR Section 11 | Good site practices will be implemented to minimise the likely effects. Section 8 of BS5228-1:2009+A1:2014 recommends a number of simple control measures as summarised below that will be employed onsite:<br>▪ Local residents will be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;<br>▪ Any extraordinary site work occurring outside of the core working hours (for example, crane operations lifting components onto the tower) will be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the site between 19:00 and 07:00, with the exception of abnormal loads that would be scheduled to avoid anticipated periods of high traffic flows;<br>▪ All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;<br>▪ Inherently quiet plant will be selected where appropriate and available - all major compressors would be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;<br>▪ All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers; | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | ▪ Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;<br>▪ All equipment used on site will be regularly maintained, including maintenance related to noise emissions;<br>▪ Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and<br>▪ All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided. | | |
| | | | **Operational Phase** | | |
| MM94 | Operational Phase Noise | EIAR Section 11 | In order to meet the noise limits at NAL3 and H02, Turbine 18 will need to be operated in a lower noise mode for a limited range of wind speeds (5 ms-1 during the daytime and 7-9 ms-1 during the night time period) and wind directions (north westerlies) when considering the 170 m rotor diameter candidate wind turbine modelled in the noise assessment. | | |
| | | | **EIAR Chapter 12 Cultural Heritage** | | |
| | | | **Construction Phase** | | |
| MM95 | Sub Surface Archaeological Potential | EIAR Section 12 | › Archaeological monitoring of ground works during construction. This will include all excavation works within the EIAR site boundary as well as any topsoil removal along the haul route (two junction accommodation areas located at Tawnaghmore and Ballygalss East as described in Section **Error! Reference source not found.**. If archaeological finds, features or deposits are uncovered during archaeological monitoring, the developer will be prepared to provide resources for the resolution of such features whether by preservation by record (excavation) or preservation in situ (avoidance). Once the project is completed, a report on the results of the monitoring will be compiled and submitted to the local | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | authorities and the National Monuments Service. The National Monuments Service will be informed of such findings to discuss how best to proceed. | | |
| **Chapter 14 Material Assets** | | | | | |
| **Pre-Commencement** | | | | | |
| MM96 | Water Supply | EIAR Section 14 | In advance of any construction activity for the grid route, the contractor will undertake pre-commencement surveys of the proposed route to confirm the presence or otherwise of any services such as water supply. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works. In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service within the public road corridor. The works will be carried out in accordance with the specifications of the relevant utility provider. | | |
| **Construction Phase** | | | | | |
| MM97 | Gas Pipeline | EIAR Chapter 14 | ▪ GNI will be notified within a minimum of 5 working days prior to commencement of construction.<br>▪ A minimum of 3 working days will be provided to GNI to mark out the transmission pipeline route.<br>▪ The marked area will be fenced off from wind farm vehicle or personnel entry during the construction phase. However, continuous access will be provided to all GNI members.<br>▪ The required construction zone setbacks as listed in Table 14-2 above will be in place and adhered to for the duration of the construction phase. As required in the GNI *Code of Practise*, where works e.g. road upgrades and crossing points fall within these zones, notification will be given to GNI. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | ▪ Should any backfilling over, or alongside the transmission pipeline, the developer will seek GNI's agreement to proceed. GNI require two working days' notice prior to any proposed backfilling.<br>▪ In the event of gas leakage do not switch any machinery on or off in the vicinity of the leak.<br>▪ Prohibit smoking, the use of naked flames, the use of electrical switches, the use of mobile phones and the use of all other ignition sources in the vicinity of the leak/damage.<br>▪ Evacuate all personnel away from and up wind of the affected area.<br>▪ Ensure that no one approaches the affected area without the consent of Gas Networks Ireland.<br>▪ Once clear of the area, report the damage or leakage, however minor it may appear, to the Gas networks Ireland 24hr Emergency Service on 1850 20 50 50.<br>▪ Do not attempt to repair the damage or stop the leak.<br>▪ All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan. | | |
| MM98 | Overhead Lines | EIAR Section 14 | ▪ Goal posts will be established under the two overhead lines for the entirety of the construction phase. They will not exceed a height of 4.2 metres, unless specifically agreed with ESB Networks<br>▪ The suitability of machinery and equipment for use near power lines will be risk assessed.<br>▪ All staff will be trained on the routes and operating voltages of overhead electricity lines running across the L-52926. All staff will be trained to be aware of the risks associated with overhead lines. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | All contractors that may visit the sites are made aware of the location of lines before they come on to site.<br>▪ Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire.<br>▪ Prior to the delivery of turbines to the Proposed Development site, a dry run of the route using vehicles with similar dimensions will occur. Please see section 14.1 above for details.<br>▪ When activities must be carried out beneath overhead lines, e.g. component delivery or grid cable laying, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used is undertaken prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required.<br>▪ Information on safe clearances will be provided to all staff and visitors.<br>▪ Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on site.<br>▪ All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan. | | |
| **Operational Phase** | | | | | |
| MM99 | Gas Pipeline | EIAR Chapter 14 | Any maintenance works by the developer in the pipeline area will first require approval by GNI and all health and safety measures will be adhered to. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| MM100 | Telecommunications | EIAR Chapter 14 | In the event of interference occurring to telecommunications, the Department of the Environment, Heritage and Local Government Wind Farm Planning Guidelines (2006) state that these effects can be dealt with by the use of divertor relay links out of line with the proposed wind turbines. | | |
| MM101 | Aviation | EIAR Chapter 14 | IAA noted that given the distance from the site to the airports, general observations pertaining to lighting and turbine coordinate provision should be followed. Department of Defence provided general observations pertaining to lighting specifications. The requirements outlined will be adhered to. | | |
| **Decommissioning Phase** | | | | | |
| MM102 | Decommissioning | EIAR Section 14 | The measures outlined for the construction phase are considered the same for the decommissioning phase. | | |
| **Chapter 14 – Traffic** | | | | | |
| **Pre-Commencement** | | | | | |
| MM103 | Traffic | | Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána . The TMP includes recommendations, which will include the measures below as a minimum requirement, for the following:<br>• **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.<br>• **Delivery Programme** – a programme of deliveries will be submitted to the County Council in advance of deliveries of turbine components to site. Liaison with the relevant local authorities and Transport Infrastructure Ireland (TII) will be | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site.<br>- **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.<br>- **A Pre and Post Construction Condition Survey** – Where required by the local authority, a pre-condition survey of roads associated with the Proposed Development will be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. Where required the timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.<br>- **Liaison with the relevant local authority** - Liaison with the County Councils and An Garda Síochána / Police Service of Northern Ireland, will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and “prior to commencement” status of the relevant roads established, (in compliance with the provisions of the CEMP), the Roads section will be informed of the relevant names and contact numbers for | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| | | | the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.<br>- **Implementation of temporary alterations to road network at critical locations** – at locations highlighted in section 14.1.8. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable.<br>- **Identification of delivery routes** – These routes will be agreed with the County Councils and adhered to by all contractors.<br>- **Delivery times of large turbine components** - The management plan includes the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.<br>- **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site.<br>- **Additional measures** - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required. These are set out in the CEMP which is contained in Appendix 4.3.<br>- **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| MM104 | Traffic | | The construction of this development will require significant coordination and the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed wind farm.<br><br>**Delivery of abnormal sized loads**<br><br>The following are the main points to note for these deliveries. These will take place after peak evening traffic:<br>- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.<br>- The deliveries will be made in consultation with the Local Authority and An Garda Síochána.<br>- It is estimated that 189 abnormal sized loads will be delivered to the site, comprising 38 convoys of 5, undertaken over 38 separate nights.<br>- These nights will be spread out over an approximate period of 19 weeks and will be agreed in advance with the relevant authorities<br>- In order to manage each of the travelling convoys, for each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles.<br>- There will also be two escort vehicles provided by the haulage company for each convoy. | | |

| Ref. No. | Reference Heading | Reference Location | Mitigation Measure | Audit Result | Action Required |
|---|---|---|---|---|---|
| **Decommissioning Phase** | | | | | |
| MM105 | Decommissioning | EIAR Section 14 | When the Proposed Development is decommissioned, a decommissioning plan will be prepared for agreement with the local authority, as described in Section 4.11 of Chapter 4. This plan will include a traffic management plan and other similar mitigation measures to those implemented during the construction phase. In terms of traffic effects the decommissioning stage will generally mirror the constructions stage although the effects will be significantly reduced as the volumes of materials removed from the site will be less. | | |

# 7. MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement, construction and operational phases of the Proposed Development were set out in various sections of the EIAR, NIS and Biodiversity Enhancement Plan prepared as part of the planning permission application to An Board Pleanála.

This section of the Construction and Environment Management Plan groups together all of the monitoring proposals presented in the EIAR. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits

*Table 7-1 Monitoring Measures*

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| **Pre-Construction Phase** | | | | | | |
| MX1 | Drainage Maintenance | EIAR Section 4<br><br>SWMP Section 4 | An inspection and maintenance plan for the drainage system on site will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the site ECoW or the Project Hydrologist. | On going | Monthly | Project Hydrologist |
| MX2 | Clear Felling of Coniferous Plantation | EIAR Section 9<br><br>SWMP Section 3 | Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling should be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown).<br>Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will also be undertaken as per water monitoring programme for the overall Proposed Development and each primary watercourse along the route. | As Required | Monthly | ECoW |
| MX3 | Drainage Inspection | SWMP Section 4 | Prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage. | As Required | Monthly | Project Hydrologist |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| MX4 | Surface Water Monitoring | SWMP Section 4 | Baseline sampling will be completed on at least two occasions and these will coincide with low flow and high flow stream conditions. The high flow sampling event will be undertaken after a period of sustained rainfall, and the low flow event will be undertaken after a dry spell. | Twice | As Required | Project Hydrologist |
| MX5 | Invasive Species | EIAR Section 6 CEMP Section 3 | A pre-commencement invasive species survey shall be completed for the site. | Once | As required | Project Ecologist |
| MX6 | Birds | EIAR Section 7 | During the breeding season (March-August) bird monitoring surveys within the Proposed Development site will take place to a distance of 500 m from the development area. However, for the bogs to the west of site, the survey that was carried out in 2022 will be repeated, with transects up to 1,000 m from the edge of the forest.  The purpose of the surveys is to confirm the locations of breeding territories prior to construction e  to ensure that mitigation is successfully implemented to avoid disturbance effects on breeding activities as a result of the works.<br><br>It is noted that the wet bog to the southwest and south of the site had not been included in the 2022 survey for health and safety reasons –. The assumption has been made that sensitive breeding species may be present (as habitat is certainly suitable to support same) and a restrictive zone of 500 m from the forest/bog edge will be implemented during the breeding season as a precautionary measure. | Once | As required | Project Ornithologist |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| | | | The survey for breeding birds on the bog (following Brown and Shepherd 1993) will take place in the April to July period (4 visits) in the season before works, including tree felling, commence. This schedule will provide guidance to the contractor on where restrictive zones are likely to be required. | | | |
| **Construction Phase** | | | | | | |
| MX7 | Archaeologica l Monitoring | EIAR Section 13 | An archaeologist will monitor excavation works associated with the grid connection cable route and a full photographic record of the bridges will be made by the archaeologist prior to the removal of any components. A report will be complied on completion of the monitoring and sent to the Local Authority and National Monuments Service. | As Required | As Required | Project Archaeologist |
| MX8 | Water Quality and Monitoring | CEMP Section 3<br><br>SWMP Section 4 | The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW on-site. The ECoW or Project Hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. | Daily | As Necessary | ECoW |
| MX9 | Water Quality and Monitoring | EIAR Section 9<br><br>SWMP Section 4 | Daily surface water monitoring forms will be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection. | Daily | As Necessary | ECoW |
| MX10 | Surface Water Quality | CEMP Section 4 | Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken as per water monitoring programme for the Proposed Development and each primary watercourse along the route. This will not | As Required | Monthly | ECoW |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| | | SWMP Section 4 | be restricted to just these locations around the proposed renewable energy development site with further sampling points added as deemed necessary by the ECoW in consultation with the Project Hydrologist and Site Manager. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring. | | | |
| MX11 | Surface water Quality Monitoring | SWMP Section 4 | During the construction phase, a field monitoring campaign will be undertaken in local streams where construction activity takes place which can affect water quality. This involves a) visual checks of drainage and streams, and b) daily measurements of field parameters temperature, pH, specific electrical conductivity (SEC), alkalinity and turbidity. Field measurements will be taken once a day, upstream and downstream of the construction activity. The field campaign will begin one week prior to activity and cease one week after activity is completed, unless observations dictate that measurements should continue. If visible impact occurs, works will be suspended at the discretion of the supervising engineer, in which case the problem will be identified and corrective action taken before recommencing works. Refer to Section 9.3.13 of the EIAR. | Daily | As Necessary | EcOW |
| MX12 | Clear felling of Coniferous Plantation | EIAR Section 9 | Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works. | As Required | Monthly | ECoW |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| MX13 | Plant and Equipment Inspections | EIAR Section 9<br><br>CEMP Section 4 | The plant used should be regularly inspected for fuel leaks, unnecessary noise generation and general fitness for purpose. | As Required | Monthly | ECoW |
| MX14 | Plant and Equipment Inspections | CEMP Section 3 | Local areas of the haul route will be condition monitored and maintained, if necessary. | Daily | Monthly | ECoW |
| MX15 | Flora and Fauna | CEMP Section 4 | A Project Ecologist will be appointed. The responsibilities and duties of the Project Ecologist will include the following:<br>- Undertake a pre-construction transect/walkover bird survey to ensure that significant effects on breeding birds will be avoided.<br>- Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Proposed Development area.<br>- Oversee management of ornithological and ecological issues during the construction period and advise on ornithological issues as they arise.<br>- Provide guidance to contractors to ensure legal compliance with respect to protected species onsite.<br>- Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress. | As required | As required | Project Ecologist |
| MX16 | Noise and Vibration | CEMP Section 4 | Monitoring typical levels of noise and vibration during critical periods and at sensitive locations will be carried out. | Daily | Monthly | ECoW |
| **Operational Phase** | | | | | | |
| MX17 | Surface Water Quality | SWMP Section 4 | Monthly sampling for laboratory analysis for a range of parameters adopted during pre-commencement and | Monthly | Monthly | ECoW |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| | | | construction phases will continue for six months during the operational phase. The Project Hydrologist will monitor and advise on the readings being received from the testing laboratory. | | | |
| MX18 | Drainage Inspections | SWMP Section 4 | The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored. | Monthly | Monthly | ECoW |
| MX19 | Water Levels in Peat | EIAR Section 9 | A network of up to 20 no. standpipes will be installed for monitoring of water levels in peat along the SAC boundaries. The purpose is to gauge potential effects. The standpipes will be measured manually on a monthly interval and a select set of 5 no. standpipes will be equipped with automatic data loggers for continuous water level measurement. The data will be periodically (quarterly) reviewed to assess whether effects are detected. | Monthly | Quarterly | ECoW/Project Hydrologist |
| MX20 | Ornithology | EIAR Section 7 | Post-construction bird monitoring is required to ensure no adverse effects on bird species as a result of the project. This extends to the site area and the bogs to the west and south-west of the site. The monitoring programme will comprise the following:<br>Flight activity surveys<br>Distribution and abundance surveys within site<br>Distribution and abundance surveys on bog<br>Collision searches<br>Searcher efficiency and predation tests will be carried out at the commencement of the programme in order to calibrate the results to account for the search dog's ability to find bird corpses and to also account for scavenging of corpses by animals. | Years 1, 2, 3, 5 | Monthly | Project Ornithologist |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| | | | The collision searches will be carried out on a monthly basis in Years 1, 2, 3, & 5 of the operational phase of the wind farm. | | | |
| MX21 | Bats | EIAR Section 6 | Bat Monitoring Plan<br>Post-construction bat monitoring will be undertaken for at least three years' post construction of the renewable energy development. The monitoring will also include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision. The results of post construction monitoring shall be utilised to assess changes in bat activity patterns and to inform the design of any advanced site specified mitigation requirements, including curtailment if deemed necessary following post construction monitoring. | Years 1, 2, 3 | Annually | Project Ecologist |
| MX22 | Flora and Fauna | EIAR Section 6 | The Proposed Development has the potential to result in enhancement of the surrounding areas through habitat rehabilitation management (as described in the Biodiversity Management and Enhancement Plan) that will be implemented during the construction phase of the Proposed Development and maintained during the operational phase. Details of the management that will be undertaken are provided in the Biodiversity Management and Enhancement Plan in Appendix 6-4 of the EIAR. These include:<br>- Drain blocking within degraded peatlands<br>- Surface Peat Assessments<br>- Vegetation Sampling<br>- Hydrological Monitoring | As required | As required | Project Ecologist |

| Ref. No. | Reference Heading | Reference Location | Monitoring Measure | Frequency | Reporting Period | Responsibility |
|---|---|---|---|---|---|---|
| **Decommissioning Phase** | | | | | | |
| MX23 | Decommissioning | DP Section 3 | The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works. | As required | As required | Site Manager |
| MX24 | Decommissioning | DP Section 3 | Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of any material proposed for use as part of foundation backfilling. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations where excavation to expose the cabling for removal will be required. | As required | As required | Project Ecologist |

# 8. PROGRAM OF WORKS

## 8.1 Construction Schedule

The construction phase will take approximately 18 – 24 months to complete from starting on site to the commissioning of the electrical system and export of electricity from site.

The EIAR stipulated that in the interest of breeding birds, construction would not commence during the breeding bird season, which runs from March to August. The EIAR also stipulated that the removal of conifers (forestry) by felling will take place between the 1st of September and the end of February, thus avoiding the period from the 1st of March to the 31st of August inclusive, as prescribed in the Wildlife Acts.

Works during the construction phase of the development, including delivery of construction materials will generally take place between 7 a.m. and 7 p.m. daily Monday to Friday and 7 a.m. to 2 p.m. on Saturdays, with large concrete pours requiring an earlier start when deemed necessary. Delivery of abnormal loads such as turbine tower sections and blades will take place at night outside of peak traffic hours.

The phasing and scheduling of the main construction task items are outlined in Figure 8-1 below, where 1st January has been selected as an arbitrary start date for construction activities.

| ID | Task Name | Task Description | Q1 2028 | Q2 2028 | Q3 2028 | Q4 2028 | Q1 2029 | Q2 2029 | Q3 2029 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Health and Safty | | | | | | | | |
| 2 | Site Compounds | Site Compounds, site access, fencing, gates | | | | | | | |
| 3 | Site Roads | Construction/upgrade of roads, construct underpasses install drainage measures, install water protection measures | | | | | | | |
| 4 | Turbine Hardstands | Excavate/pile for turbine bases where required | | | | | | | |
| 5 | Turbine Foundations | Fix reinforcing steel and anchorage system, erect shuttering, concrete pour | | | | | | | |
| 6 | Substation Construction and Electrical Works | Construct substation, underground cabling, grid connection | | | | | | | |
| 7 | Backfilling and Landscaping | | | | | | | | |
| 8 | Turbine Delivery and Erection | | | | | | | | |
| 9 | Substation Commissioning | | | | | | | | |
| 10 | Turbine Commisioning | | | | | | | | |

*Figure 8-1 Indicative Construction Schedule*

# 9. COMPLIANCE AND REVIEW

## 9.1 Site Inspections and Environmental Monitoring

Routine inspections of construction activities will be carried out on a daily and weekly basis by the ECoW and the Site Supervisor/Construction Manager to ensure all controls to prevent environmental impacts, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and all other planning application documents. Only suitably trained staff will undertake environmental site inspections.

## 9.2 Auditing

The Contractor will be responsible for implementing the mitigation and monitoring measures specified throughout the EIAR and compiled in Sections 6 and 7 of this CEMP. The Contractor will also be responsible for ensuring that all construction staff understand the importance of implementing the mitigation measures. The implementation of the mitigation measures will be overseen by the environmental clerk of works or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation.

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to highlight the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

## 9.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the proposed renewable energy development:

**Environmental Near Miss:** An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

**Environmental Incident:** Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

**Environmental Exceedance Event**: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

**Environmental Non-Compliance:** Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

## 9.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Supervisor/Construction Manager, as advised by the Site Environmental Clerk of Works. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site supervisor/Construction Manager and the ECoW will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

## 9.5 Construction Phase Review

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project and will comply with the measures set out in the NIS, EIAR and any planning conditions.

# APPENDIX 3

## CHAPTER 9 'WATER'

# 9. HYDROLOGY AND HYDROGEOLOGY

## 9.1 Introduction

CDM Smith Ireland Ltd was engaged by MKO Ireland (MKO) to assess the potential likely and significant hydrological and hydrogeological effects of the Proposed Development on the receiving water environment. The assessment is based on:

- Publicly available data and information relevant to baseline hydrological and hydrogeological conditions.
- Site-specific baseline data generated from site investigations listed in Section 9.2.2.
- Requirements for preparation of this Chapter, per relevant legislation and guidance listed in Sections 9.1.4 and 9.1.5).

The Proposed Development site location was shown in **Figure 1-1b** and the Proposed Development layout was presented in **Figure 4-1a** and **Figure 4-1b**. The site is situated within Sheskin Forest, approximately 20 kilometres west of Crossmolina and approximately 7 km northeast of Bangor Erris in Co. Mayo. The site is accessible via the N59 National Secondary and the L52926 local road in the townland of Shranakilly.

As described in Chapter 4, encompasses new and upgraded existing roadways, wind turbines, an electrical substation, a meteorological mast, grid connection cables, borrow pits, peat and spoil placement areas, and temporary construction compounds. To accommodate the Proposed Development, tree-felling and establishment of a drainage management system are also part of the planned works.

The Proposed Development area covers 1,189 hectares (ha), or 11.89 km$^2$. However, the proposed permanent development footprint is 24.22 ha, or 0.244 km$^2$.

### 9.1.1 Statement of Authority

This Chapter 9 was prepared by Henning Moe of CDM Smith Ireland Ltd. He is a registered professional geologist (P. Geo.) with the Institute of Geologists of Ireland and has more than 30 years of practical experience. He has worked on several projects for EPA related to the implementation of the European Union Water Framework Directive (WFD). This included working with EPA's Catchment Science and Management Unit to prepare guidance on Investigative Assessments of rural catchments involving a wide range of environmental pressures and mitigation measures, including those associated with peat- and forestry-related activity. Henning has also worked with both the National Parks and Wildlife Service (NPWS) and the Pesticide Control and Forestry Services of the Department of Agriculture, Food and Marine (DAFM). With MKO, he assisted the review of potential impacts of planned improvement works along the Kiltiernan-Ballinderreen Flood Mitigation Scheme on Natura 2000 sites (specifically, fens), and for Kerry County Council, he reviewed flood risk downstream of a proposed major quarry development based on a discharge of 25,000 m$^3$/d. For Irish Water, Henning peer-reviewed the hydrology and hydrogeology chapters of the EIAR for the Shannon Pipeline project which traverses more than 25 km of peatland. For Bord na Móna, he is leading the preparation of the Soils, Geology and Hydrogeology, and Water, chapters for a proposed expanded landfill development within Timahoe Bog.

Henning was supported by Dr Jon Hunt which contributed technically to the planning stage drainage plan. Jon has 20 years of experience which has included mapping upland and peat terrains through his geological research (e.g., mapping 34 km$^2$ at 1:10,560 scale in upland areas of the west of Ireland), and managing flood risk assessments of housing developments using modelling techniques and mitigation measures to alleviate potential downstream risks and impacts.

Technical review was provided by Ruairi O'Carroll BE MEng Sc CEng MIEI, a chartered engineer with over 20 years of experience in the management and delivery of environmental and engineering projects. Ruairi has prepared feasibility studies, preliminary reports and assessment studies for a range of water and environmental projects, and has extensive expertise in the preparation of tender documents, procurement and contract management.

## 9.1.2 Objectives

The objectives of this Chapter 9 are to:

- Present the methodology that was applied to assess potential and likely significant effects of the Proposed Development;
- Describe the hydrological and hydrogeological settings and baseline conditions of the Proposed Development area;
- Identify likely significant effects of the Proposed Development on surface water and groundwater resources, and the associated receiving environment during construction, operational and decommissioning phases of the Proposed Development;
- Identify and describe suitable and proposed mitigation measures that will be implemented to avoid, reduce or offset significant negative effects;
- Assess likely significant residual effects;
- Assess cumulative effects of the Proposed Development after mitigation measures are implemented, in associated with other relevant developments that are identified in the area.

## 9.1.3 Scope and Consultation

As described in Chapter 2, scoping was undertaken during the preparation of this EIAR. Scoping responses are included in **Appendix 2-1**. Inputs from consultees have informed the preparation of content in this Chapter 9. Key matters that were raised in respect of hydrology and hydrogeology are summarised in **Table 9-1**.

*Table 9-1 Summary of Hydrological and Hydrogeological Matters Raised by Consultees*

| Consultee | Matters Raised | Addressed in Chapter Section |
|---|---|---|
| Development Application Unit Department of Housing, Local Government and Heritage (DHLGH) | In summary, DHLGH requested the following to be addressed:<br>- The EIAR must demonstrate that the proposed wind farm development will not pose any threat to surface waters and associated species (e.g. Salmon).<br>- The impacts of tree felling on wildlife, habitats and surface waters (e.g. water quality) should be assessed fully, including the risk of phosphate mobilisation from peat soils as a result of tree clearance and ground disturbance.<br>- The likely impacts of grid connection, particularly for birds, sensitive habitats and surface waters, should be given due consideration at the EIA stage.<br>- Recommendations for the preparation of a Construction Management Plan were also provided. | Section 9.4;<br>Chapter 6 of the EIAR<br><br>Chapter 6 of the EIAR<br>Section 9.4.2<br><br>Section 9.4.2.4; Appendix 9-4<br><br>Appendix 4-1, Appendix 4-3 |
| Inland Fisheries Ireland (IFI) - Shannon Region & Western Region | In summary, IFI requested the following to be addressed:<br>- Water quality<br>- Surface water hydrology<br>- Sediment transport | Chapter 9 in its entirety |

| | | |
|---|---|---|
| Geological Survey Ireland (GSI) | GSI provided background information and a list of our publicly available datasets to be considered. | Chapter 8 of the EIAR<br>Section 9.3.8 |
| Irish Peatland Conservation Council (IPCC) | In summary, IPCC requested the following to be addressed:<br>› Account for nitrogen within pre-planning coupled with a nitrogen monitoring agenda which could highlight possible pathways of nutrient enrichment.<br>› Ensure that the proposed development will not adversely impact on the water quality.<br>› Assess the cumulative effects of windfarms, afforestation, peat extraction, drainage, overgrazing on the environment - specifically including the designated sites - and also assess the implications of impacts on annexed species and biodiversity. | Sections 9.3.7, 9.3.13<br>Sections 9.4.2 through 9.4.4<br>Section 9.4.5;<br>Section 9.4.3.4, Appendix 9-4;<br>Chapter 6 of the EIAR |
| Mayo County Council (MCC) | MCC requested information on slopes, soil type, bedrock, depth to bedrock, depth to groundwater and depth to be peat to be presented. MCC also requested information related to:<br>› Forestry proposals, notably clear-felling and afforestation plans.<br>› Existing drainage onsite.<br>› Details of overall site management relative to water courses, with regard to the Water Framework Directive and any relevant River Basin Management Plan, including impact on downstream water body status.<br>Moreover, MCC requested information, as follows:<br>› The hydrological context of the site.<br>› Baseline water quality conditions prior to works commencing onsite.<br>› Delineation of subcatchments for each turbine, including slope and drainage.<br>› Location and flow direction of all streams and drains.<br>› Details of how water crossings will be designed and constructed to reduce impacts to the receiving environment.<br>› A cumulative impact assessment which shows and has regard to other wind farms in the area, quarries, flood relief works, cutover bogs, substations, grid connections.<br>› A Construction Environmental Management Plan. | Chapter 8<br>Appendix 4-2; Appendix 8-1<br>Sections 9.3.1, 9.3.8<br>Chapter 4<br>Sections 9.3.2, 9.3.7<br>Section 9.4.3.2, 9.4.3.4<br>Appendix 4-1; Appendix 4-4;<br>Appendix 9-3, Appendix 9-4<br>Sections 9.3.2, 9.3.5, 9.3.6<br>Section 9.3.7<br>Section 9.3.12<br>Appendix A of Appendix 4-4<br>Chapter 4; Appendix 4-1<br>Section 9.4.2.2, 9.4.2.3, 9.4.2.4<br>Section 9.4.5<br>Appendix 4-3 |

## 9.1.4 Relevant Legislation

This Chapter 9 was prepared in accordance with the legislation itemised in Chapter 1 (Introduction) and the following guidance documents:

- Environmental Protection Agency (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Report
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.

- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Scottish Natural Heritage (2010): Good Practice During Wind Farm Construction.
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note).
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note).
- CIRIA (Construction Industry Research and Information Association) (2006): Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (CIRIA C532, 2006).

# 9.2 Assessment Methodology

## 9.2.1 Desk Study

A desk study of the Proposed Development site and potential receiving environment was completed which involved collecting relevant data and information from publicly available sources, namely:

- OPW Flood Risk Information, including the CFRAM Flood Risk Assessment mapping (www.floodinfo.ie).
- Environmental Protection Agency (EPA) 'Water' web viewer and databases related to implementation of the Water Framework Directive (WFD) - https://gis-stg.epa.ie/EPAMaps/Water and www.catchments.ie
- EPA and Office of Public Works (NPWS) stream gauging station data.
- Geological Survey of Ireland (GSI) map coverages available on their web viewer.
- EPA and Teagasc soils maps.
- Historical aerial imagery and mid-19$^{th}$ century 6-inch and 25-inch sheets from Ordnance Survey Ireland.
- National Parks and Wildlife Services Public Map Viewer (www.npws.ie).
- Met Eireann rainfall and evapotranspiration data and maps.

Publicly available reports (e.g. from GSI) and journal (research) articles were also used, and are referenced throughout this Chapter 9.

## 9.2.2 Baseline Monitoring and Site Investigations

Data and findings from site investigations were also used for the description of baseline conditions, specifically:

- Trial pits were excavated by Irish Drilling Ltd (IDL) under the supervision of Fehily Timoney (FT) in November 2021 (IDL, 2022).
- Water level measurements in peat and surface water sampling was undertaken by Tobin Consulting Engineers (TCE) between August 2020 and August 2021 (TCE, 2021).
- Peat probing as part of a geotechnical and peat stability assessment was undertaken by FT between March 2021 and May 2022 (FT, 2022).
- A walkover survey was conducted by CDM Smith in July 2021, with a focus on the existing site drainage.

Related data and findings are presented in subsequent sections.

## 9.2.3 Assessment Methodology

Using the information from the desk study and site investigations, the importance and environmental sensitivity of the receiving environment was judged by the criteria presented in **Table 9-2** (hydrology) and **Table 9-3** (hydrogeology).

*Table 9-2 Estimation of Importance of Hydrology Attributes (NRA, 2009)*

| Importance | Criteria | Example |
|---|---|---|
| Extremely High | Attribute has a high quality or value on an international scale | River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988. |

| | | |
|---|---|---|
| Very High | Attribute has a high quality or value on a regional or national scale | River, wetland or surface water body ecosystem protected by national legislation – NHA status.<br>Regionally important potable water source supplying >2500 homes.<br>Quality Class A (Biotic Index Q4, Q5).<br>Flood plain protecting more than 50 residential or commercial properties from flooding.<br>Nationally important amenity site for wide range of leisure activities. |
| High | Attribute has a high quality or value on a local scale | Salmon fishery.<br>Locally important potable water source supplying >1000 homes.<br>Quality Class B (Biotic Index Q3-4).<br>Flood plain protecting between 5 and 50 residential or commercial properties from flooding.<br>Locally important amenity site for wide range of leisure activities. |
| Medium | Attribute has a medium quality or value on a local scale | Coarse fishery.<br>Local potable water source supplying >50 homes.<br>Quality Class C (Biotic Index Q3, Q2-3).<br>Flood plain protecting between 1 and 5 residential or commercial properties from flooding. |
| Low | Attribute has a low quality or value on a local scale | Locally important amenity site for small range of leisure activities.<br>Local potable water source supplying <50 homes.<br>Quality Class D (Biotic Index Q2, Q1).<br>Flood plain protecting 1 residential or commercial property from flooding.<br>Amenity site used by small numbers of local people. |

*Table 9-3 Estimation of Importance of Hydrogeological Attributes (NRA, 2009)*

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

| | | |
|---|---|---|
| | | Inner source protection area for locally important water source. |
| Medium | Attribute has a medium quality or value on a local scale | Locally Important Aquifer.<br>Potable water source supplying >50 homes.<br>Outer source protection area for locally important water source. |
| Low | Attribute has a low quality or value on a local scale | Poor Bedrock Aquifer.<br>Potable water source supplying <50 homes. |

The assessment of likely significant effects in this chapter uses the effects classification terminology of EPA (2022), as presented in **Table 9-4**. Descriptors of effects include quality (negative, positive or neutral), significance, probability/likelihood, duration and/or frequency, and type.

*Table 9-4 Effect Classification Terminology (EPA, 2022)*

| Impact Characteristic | Term | Description |
|---|---|---|
| Quality | Positive | A change which improves the quality of the environment |
| | Neutral | No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error. |
| | Negative | A change which reduces the quality of the environment. |
| Significance | Imperceptible | An effect capable of measurement but without significant consequences. |
| | Not significant | An effect which causes noticeable changes in the character of the environment but without significant consequences |
| | Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities |
| | Moderate | An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends |
| | Significant | An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment |
| | Very significant | An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment |
| | Profound | An effect which obliterates sensitive characteristics |
| Extent and Context | Extent | Describe the size of the area, number of sites and the proportion of a population affected by an effect |
| | Context | Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions |
| Probability | Likely | Effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented |
| | Unlikely | Effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented |
| Duration and Frequency | Momentary | Effects lasting from seconds to minutes |
| | Brief | Effects lasting less than one day |
| | Temporary | Effects lasting less than one year |
| | Short-term | Effects lasting 1-7 years |
| | Medium-term | Effects lasting 7-15 years |
| | Long-term | Effects lasting 15-60 years |
| | Permanent | Effects lasting over 60 years |
| | Reversible | Effects that can be undone, for example through |

| | | |
|---|---|---|
| | | remediation or restoration |
| | Frequency | Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually) |
| Types | Indirect | Effect on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway |
| | Cumulative | The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects. |
| | 'Do Nothing' | The environment as it would be in the future should the subject project not be carried out |
| | 'Worst Case' | The effects arising from a project in the case where mitigation measures substantially fail |
| | Indeterminable | When the full consequences of a change in the environment cannot be described. |
| | Irreversible | When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost |
| | Residual | The degree of environmental change that will occur after the proposed mitigation measures have taken effect |
| | Synergistic | Where the resultant effect is of greater significance than the sum of its constituents |

In addition, the two impact characteristics proximity and probability are described for each effect considered, and these are defined in **Table 9-5**.

*Table 9-5 Additional Impact Characteristics Considered*

| Impact Characteristic | Degree/Nature | Description |
|---|---|---|
| Proximity | Direct | An impact which occurs within the area of the proposed project, as a direct result of the proposed project. |
| | Indirect | An impact which is caused by the interaction of effects, or by off-site developments. |
| Probability | Low | A low likelihood of occurrence of the impact. |
| | Medium | A medium likelihood of occurrence of the impact. |
| | High | A high likelihood of occurrence of the impact. |

# 9.3 Existing Environment

## 9.3.1 Physiographic Setting and Topography

The Proposed Development site is situated in a forested upland blanket bog setting on the southeast facing slopes of Slieve Fyagh. Topographic elevation within the Proposed Development site boundary ranges from approximately 290 mOD to approximately 105 mOD and topographic slope ranges from <2 to approximately 8 degrees. Detailed slope descriptions of planned turbine locations are provided in **Appendix 8-1**.

Land uses within the Proposed Development site are predominantly dense commercial forestry and recently felled scrubland.

## 9.3.2 Regional and Local Drainage

The Proposed Development site is situated in a headwater subcatchment of the Owenmore River which drains to Tullaghan Bay (**Figure 9-1**). The Owenmore River catchment[1] encompasses a total area of approximately 300 km$^2$ and incorporates streams that drain south through the Oweninny River sub-catchment and north from the Nephin Beg range.

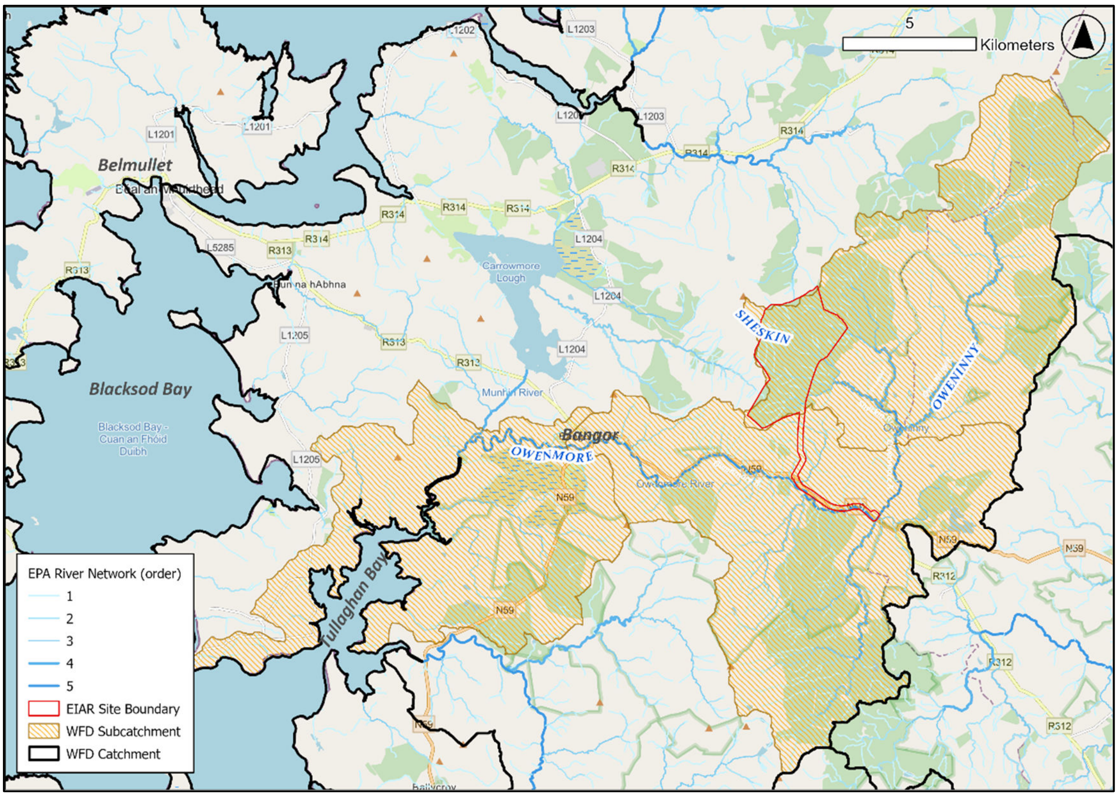


*Figure 9-1 Regional Drainage of the Owenmore River Catchment*

The headwaters that encompass the Proposed Development site are shown in **Figure 9-2**. They are:

- Sheskin River, which drains the southern part of Sheskin forest.
- An unnamed stream, which drains the northern part of Sheskin forest.
- Local streams that drain southeast to the Owenmore River

The Sheskin River and unnamed stream subcatchments cover an area of approximately 31.4 km$^2$ which is approximately 13% of the total Owenmore River catchment.

As depicted in **Figure 9-2**, both Sheskin River and the unnamed stream originate at higher elevation within Sheskin Forest, being fed by runoff and originating as a series of bog seeps/springs. Several small tributaries merge progressively as they flow eastward. The seeps and springs at higher elevation appear as 'rises' on the 6-inch sheets from OSI which show the original, natural drainage pattern of the site in the mid-19$^{th}$ Century.

The Sheskin River and unnamed stream merge on lower ground to the east of the Proposed Development site. From their point of merger, the streams flow combined as the Sheskin River before merging with the Oweninny River in the townland of Shranakilly. South of this confluence point, the Oweninny River becomes the Owenmore River. An important EPA water quality monitoring station

[1] Defined by WFD subcatchments Owenmore(Mayo)_SC_010, Owenmore(Mayo)_SC_020 and Owenmore(Mayo)_SC_030

(labelled 'RS33S030150' in **Figure 9-2**) is located on the Sheskin River just upstream of the confluence (See Section 9.3.7 for details).

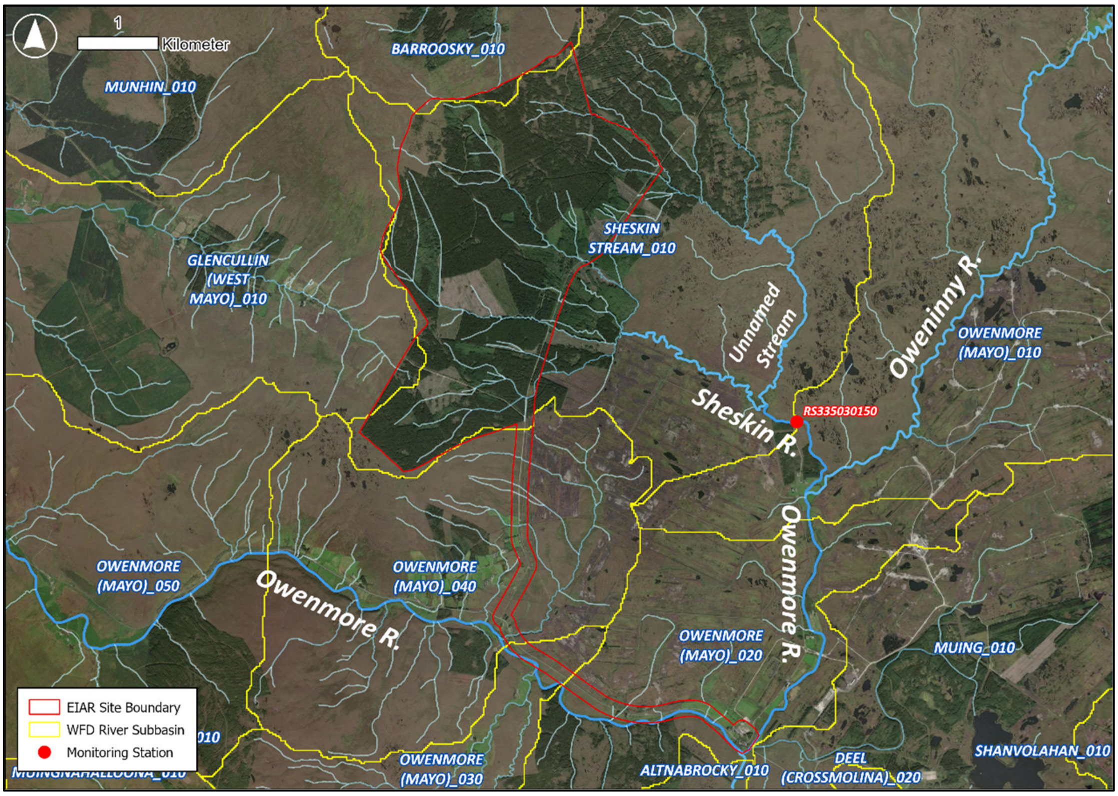

*Figure 9-2 Local Drainage and WFD River Sub-basins*

The Owenmore River subsequently turns sharply to the west at Bellacorick (by the N59 National Primary Road), from where it subsequently flows west through Bangor Erris and discharges to sea in Tullaghan Bay. The distance of flow from Sheskin Forest to sea via the Owenmore River is approximately 30 km.

The grid connection route of the Proposed Development also crosses the subcatchment of a series of local streams which drain south from the southern boundary of Sheskin forest. These unnamed tributaries flow directly into Owenmore River in the townland of Tawnaghmore.

## 9.3.3 Site Drainage

The Proposed Development site in Sheskin Forest is extensively drained as part of the ongoing forestry operations. Types of drains observed were 'mound' drains, ploughed drains, and interceptors drains. The drains serve to lead runoff from plantations to local streams. During the walkover surveys, the majority of interceptor drains were heavily vegetated, yet transmitted flow. Silt traps were also observed.

The drains tend to be linear and run in parallel with variable spacing. They follow the orientations of plantations and often run at oblique angles to roads and topographic contours.

Interceptor drains were observed upgradient and downgradient of both forestry plantations and existing access roads. Based on observation, they are mostly shallow (<1 m deep) but cut into peat and/or the underlying subsoils.

## 9.3.4 Potential Receptor Environments

The potential receptors associated with the Proposed Development are:

- The headwater streams in and south of Sheskin Forest.
- The Sheskin and Owenmore Rivers downstream of the Sheskin Forest.
- Groundwater beneath the Proposed Development site.

In context of EPA's coding of water bodies for Water Framework Directive (WFD) implementation and reporting purposes, the relevant receptor surface water bodies are part of the 'Owenmore(Mayo)_SC_010' subcatchment, specifically the following water bodies (shown in **Figure 9-2**):

- Sheskin Stream_010 (code IE_WE_33S030150)
- Owenmore(Mayo)_010 (code IE_WE_33O040050)
- Owenmore(Mayo)_020 (code IE_WE_33O040200), downstream.
- Owenmore(Mayo)_040 (code IE_WE_33O040270), which is associated with the grid connection route.

The relevant groundwater bodies which underlie the Proposed Development site are:

- Belmullet (code IE_WE_G_0057)
- Bangor (code IE_WE_G_0052)

## 9.3.5 Water Balance Components

Natural drainage and streamflows are influenced by rainfall, runoff and recharge. Runoff, which is influenced by rainfall events and the physical attributes of subcatchments, influences the drainage design of the Proposed Development. To estimate runoff, both long-term annual average and return period characteristics must be defined.

### 9.3.5.1 Long Term Annual Average Rainfall, Runoff and Recharge

The nearest synoptic weather station with long-term rainfall and evaporation data is Belmullet. This station is near sea level and approximately 27 km west of the site. The mean annual rainfall for the 30-year period 1981-2010 is 1,248 mm, and as presented in **Table 9-6**, the wettest month historically is October.

*Table 9-6 Mean Monthly Rainfall, Belmullet Synoptic Weather Station, 1981-2010*

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean monthly total | 134.0 | 97.1 | 99.2 | 72.0 | 70.4 | 72.1 | 79.0 | 101.9 | 101.8 | 145.9 | 134.0 | 137.4 |
| Greatest daily total | 44.7 | 31.3 | 25.6 | 25.9 | 42.2 | 38.9 | 33.2 | 49.5 | 62.6 | 79.6 | 43.0 | 41.7 |
| Mean no. days with >= 5.0mm | 10.0 | 7.0 | 7.0 | 4.0 | 4.0 | 4.0 | 5.0 | 6.0 | 6.0 | 10.0 | 10.0 | 9.0 |

The Proposed Development site is situated at a higher elevation than the synoptic weather station at Belmullet, at approximately 250 mOD. This means that rainfall in the catchment of the Sheskin River will be slightly higher than at Belmullet. Following a rule of thumb of 100 mm of rainfall per 100 m increase elevation, the mean annual rainfall in Sheskin Forest is expected to be in excess of 1,500 mm.

Based on EPA's Qube model of river flows in ungauged catchments in Ireland (available from EPA's 'Water' web viewer[2], the long-term annual average rainfall (AAR) within the Proposed Development site is approximately 1,536 mm/year. Potential evapotranspiration (PET) is approximately 480 mm/year. Using these figures, effective rainfall (ER), which represents the rainwater that is available for runoff and groundwater recharge, is approximately:

ER = AAR – PET = 1,536 – 480 = 1,056 mm/year

Based on the national groundwater recharge map prepared by GSI, 10% or less of ER is recharged to the bedrock aquifer. For an ER of 1,056 mm/year and a recharge coefficient of 10%, groundwater recharge would be 106 mm/year. This value is close to the recharge 'cap' of 100 mm/year which GSI assigns to 'poorly productive bedrock aquifer' and which underlies the site (Chapter 8). Poorly productive bedrock does not have the physical characteristics and capacity to accept all of the available, infiltrating water. Hence, the excess recharge is 'rejected.' This enhances flow via shallow pathways, including runoff.

Accordingly, it is inferred that long term average groundwater recharge to bedrock is approximately 100 mm/year at the site, and the remainder of water, 956 mm/yr, is available as runoff and shallow groundwater flow through subsoils. This implies that the runoff potential approaches 90% of effective rainfall.

The hydrology of the Proposed Development site is, therefore, characterised by high runoff rates and low groundwater recharge rates (to bedrock). Water logged peat will enhance lateral runoff of rainwater to streams.

### 9.3.5.2 Baseline Assessment of Runoff

Long-term average runoff volumes were calculated further for the Proposed Development site by considering:

- The estimated long-term average annual rainfall at the site (1,536 mm/yr).
- Applying a further escalation factor of 1.1 to account for higher rainfall due to climate change.
- Evapotranspiration, to estimate the effective rainfall.
- Applying a 90% runoff coefficient to the effective rainfall value.
- Multiplying the resulting depth of water to the Proposed Development site to obtain an average runoff volume.

The calculation is presented in **Table 9-7**.

*Table 9-7 Estimated Long-term Average Annual Runoff*

| Item | Value | Comment |
|---|---|---|
| Long-term average annual rainfall | 1,536 mm/yr | Sourced from EPA's Qube model |
| Escalated rainfall | 1,690 mm/yr | Accounts for climate change in future, with a net increase in rainfall totals |
| Mean annual evapotranspiration | 480 mm/yr | From Met Eireann national map of Potential evapotranspiration |
| Effective rainfall | 1,690-480 mm/yr = 1,210 mm/yr | Effective rainfall = available recharge |
| Runoff coefficient | 90% | 10% is groundwater recharge |
| Baseline runoff depth | 1,220 mm/yr × 90% = 1,089 mm/yr | |
| Proposed Development site area | 11.89 km$^2$ | Excluding the grid connection route[1] |

[2] https://gis-stg.epa.ie/EPAMaps/Water

| | | |
|---|---|---|
| Long-term average annual runoff | 11.89 km$^2$ × 1,098 mm/yr = 13,055,220 m$^3$/yr, or 35,768 m$^3$/d, or 0.414 m$^3$/s. | |

Note:
[1]the grid connection route covers a narrow linear path which is on lower elevation and slope, and does not materially affect the overall estimation of runoff.

### 9.3.5.3 Streamflow

Runoff contributes to streamflow and estimates of streamflow were obtained from EPA's Qube model for naturalized streamflow in ungauged catchments.[3] The Proposed Development site is covered by the two Qube model subcatchments that are shown as the lighter shaded green areas across Sheskin Forest (deep green area) in **Figure 9-3**, as extracted from EPA's 'Water' web viewer. The two subcatchments cover areas of 13.58 and 8.97 km$^2$, respectively, for a total combined area of 22.55 km$^2$.

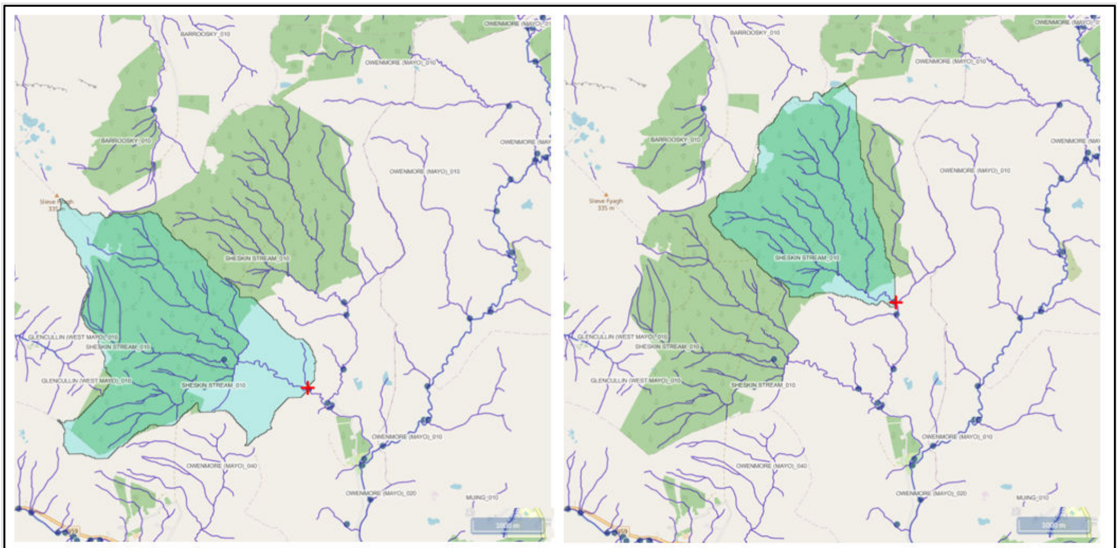


*Figure 9-3 Locations and Catchments of Qube Model Nodes 33_264 (red cross, left) and CD 33_2788 (red cross, right)*

The model-derived flow percentiles for the two subcatchments are presented in **Figure 9-4**. Flood flow conditions are represented towards the left side of the graph while low flow conditions are represented towards the right. As an example, a flow percentile of 10 in **Figure 9-4** represents the flow that is exceeded 10% of the time (at Qube model nodes 'CD 33_264' and 'CD 33_2788', indicated by the red crosses in **Figure 9-3**).

[3] https://www.epa.ie/our-services/monitoring--assessment/freshwater--marine/rivers/water-level-and-flow-data/

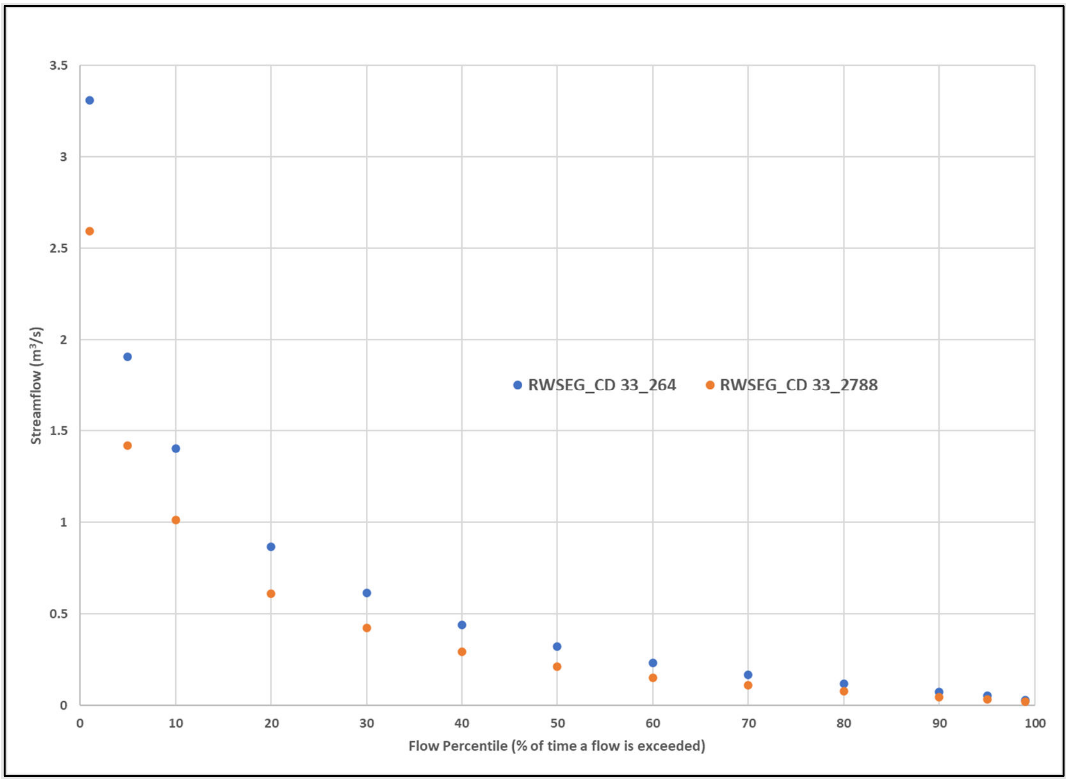


*Figure 9-4 Model-estimated Flow Percentiles for the Two Main Streams Exiting Sheskin Forest*

Based on **Figure 9-4**:

- Peak estimated streamflows, represented by the 1-percentile flow, is 2.59 and 3.31 $m^3/s$, respectively in the two subcatchments, for a sum of 5.90 $m^3/s$.
- Mean estimated streamflows, which is approximated by the 30-percentile flow (LAWPRO/EPA, 2022), are 0.423 and 0.614 $m^3/s$, respectively, for a sum of 1.037 $m^3/s$.
- Low-flow conditions, which are generally defined by the estimated 95-percentile flows, are 0.035 and 0.053 $m^3/s$, respectively, for a sum of 0.088 $m^3/s$.

Based on the runoff coefficient of 90%, an estimated 0.933 $m^3/s$ (i.e., 90% of the 1.037 $m^3/s$ total mean flow) is inferred to represent mean annual runoff from the Proposed Development site. The remaining 10% is contributed by groundwater baseflow.

The proportion of the model-derived mean flow value that originates within the area of the proposed permanent development footprint (11.89 $km^2$) would be 1.037 $m^3/s \times (11.89/22.55) = 0.55$ $m^3/s$, or 47,242 $m^3/d$.

The Qube modeled flows in **Figure 9-4** cover a wide range of values. This is characteristic of 'flashy' catchments, in which both runoff and streamflow respond quickly to rainfall events. In such catchments, both individual storm events and antecedent (particularly wet) hydrological conditions can significantly influence runoff rates.

The flashy nature of the catchment is reflected in the river stage of the Owenmore River near Bangor Erris, shown in **Figure 9-5**, with rapidly rising and falling water levels. Although river flow data for the Bangor gauging station are not available, other gauging stations in northwest Co. Mayo and outside of the catchment of the Proposed Development area show similar hydrological behaviour.

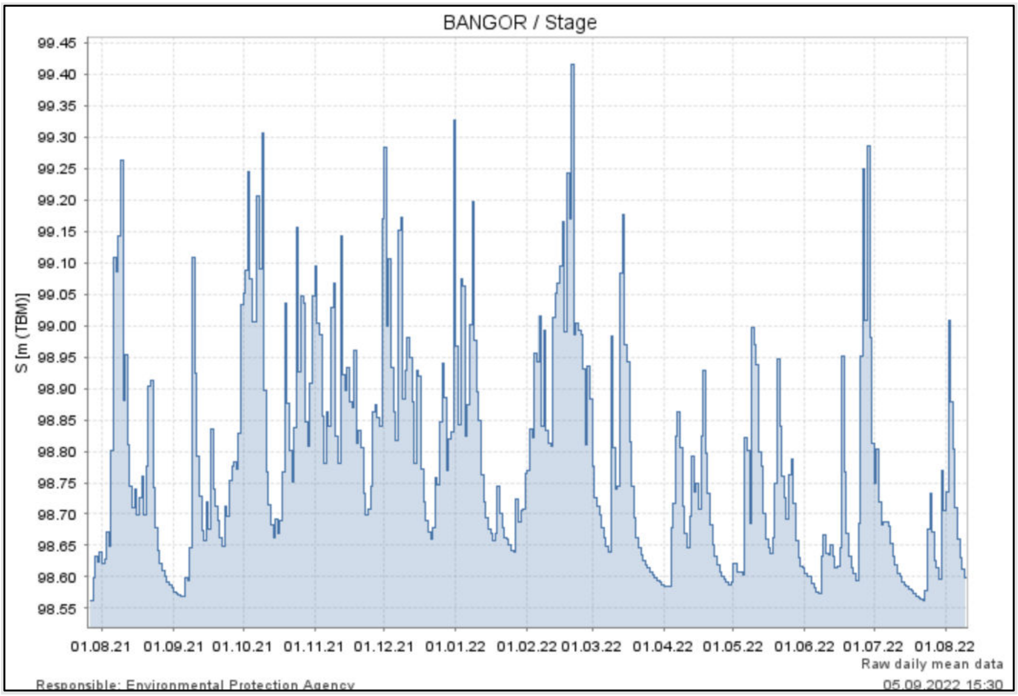


*Figure 9-5 Owenmore River Stage at Bangor Gauging Station, January 2021 to January 2022*

Adjusted for the respective subcatchment areas in **Figure 9-3** (8.97 and 13.58 km$^2$, respectively), the mean streamflow values from **Figure 9-4** produce similar specific runoff values for each subcatchment of 0.047 and 0.045 m$^3$/s/km$^2$, respectively.

### 9.3.5.4 Rainfall Return Periods

**Table 9-8** below presents return period rainfall depths for the Proposed Development site, specifically at Irish Grid coordinate 93929E 327473N. The data were sourced from Met Eireann and provide rainfall depths for a range of storm durations and return periods. These values were sourced to compute design runoff rates in **Appendix 9-3**, but **Table 9-8** is also relevant to the understanding of scale of recorded flood events in the area, as described below.

*Table 9-8 Rainfall Return Periods for Irish Grid Location 93828E, 327473N (Source: Met Eireann)*

| Duration | Interval | | Years | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 Months | 1 Year | 2 | 3 | 4 | 5 | 10 | 20 | 30 | 50 | 75 | 100 | 150 | 200 | 250 | 500 |
| 5 mins | 3.0 | 4.2 | 4.8 | 5.8 | 6.4 | 6.9 | 8.6 | 10.4 | 11.7 | 13.4 | 14.9 | 16.1 | 17.9 | 19.3 | 20.5 | n/a |
| 10 mins | 4.1 | 5.8 | 6.7 | 8.0 | 8.9 | 9.6 | 11.9 | 14.5 | 16.2 | 18.6 | 20.8 | 22.4 | 25.0 | 26.9 | 28.6 | n/a |
| 15 mins | 4.9 | 6.8 | 7.9 | 9.5 | 10.5 | 11.3 | 14.0 | 17.1 | 19.1 | 21.9 | 24.4 | 26.4 | 29.4 | 31.7 | 33.6 | n/a |
| 30 mins | 6.4 | 8.9 | 10.2 | 12.2 | 13.5 | 14.5 | 17.8 | 21.5 | 23.9 | 27.3 | 30.3 | 32.6 | 36.2 | 38.9 | 41.2 | n/a |
| 1 hours | 8.5 | 11.6 | 13.3 | 15.7 | 17.3 | 18.5 | 22.6 | 27.0 | 29.9 | 34.0 | 37.6 | 40.3 | 44.5 | 47.7 | 50.4 | n/a |
| 2 hours | 11.2 | 15.2 | 17.2 | 20.2 | 22.2 | 23.7 | 28.6 | 34.0 | 37.5 | 42.3 | 46.6 | 49.8 | 54.8 | 58.6 | 61.7 | n/a |
| 3 hours | 13.2 | 17.7 | 20.0 | 23.4 | 25.6 | 27.4 | 32.9 | 38.9 | 42.8 | 48.1 | 52.8 | 56.4 | 61.9 | 66.0 | 69.5 | n/a |
| 4 hours | 14.9 | 19.8 | 22.3 | 26.0 | 28.4 | 30.3 | 36.3 | 42.8 | 47.0 | 52.7 | 57.8 | 61.6 | 67.5 | 71.9 | 75.6 | n/a |
| 6 hours | 17.5 | 23.1 | 26.0 | 30.1 | 32.9 | 35.0 | 41.6 | 48.9 | 53.6 | 60.0 | 65.5 | 69.8 | 76.2 | 81.1 | 85.1 | n/a |
| 9 hours | 20.6 | 27.0 | 30.2 | 34.9 | 38.0 | 40.4 | 47.8 | 55.9 | 61.1 | 68.2 | 74.3 | 79.0 | 86.0 | 91.4 | 95.8 | n/a |
| 12 hours | 23.1 | 30.1 | 33.7 | 38.8 | 42.2 | 44.7 | 52.8 | 61.5 | 67.1 | 74.7 | 81.3 | 86.2 | 93.8 | 99.5 | 104.2 | n/a |
| 18 hours | 27.2 | 35.2 | 39.2 | 45.0 | 48.7 | 51.6 | 60.6 | 70.3 | 76.5 | 84.9 | 92.2 | 97.6 | 105.9 | 112.2 | 117.3 | n/a |
| 24 hours | 30.6 | 39.3 | 43.7 | 49.9 | 54.0 | 57.2 | 66.9 | 77.4 | 84.0 | 93.0 | 100.8 | 106.6 | 115.4 | 122.1 | 127.6 | 146.0 |
| 2 days | 40.4 | 50.6 | 55.7 | 62.9 | 67.5 | 71.0 | 81.8 | 93.2 | 100.4 | 110.1 | 118.3 | 124.5 | 133.7 | 140.6 | 146.3 | 165.2 |
| 3 days | 49.0 | 60.5 | 66.1 | 74.1 | 79.2 | 83.0 | 94.8 | 107.1 | 114.8 | 125.1 | 133.8 | 140.3 | 150.0 | 157.3 | 163.2 | 182.9 |
| 4 days | 56.9 | 69.5 | 75.7 | 84.3 | 89.8 | 93.9 | 106.6 | 119.7 | 127.9 | 138.7 | 147.9 | 154.8 | 165.0 | 172.6 | 178.7 | 199.1 |
| 6 days | 71.6 | 86.2 | 93.3 | 103.1 | 109.3 | 113.9 | 128.1 | 142.7 | 151.7 | 163.6 | 173.6 | 181.1 | 192.1 | 200.3 | 206.9 | 228.7 |
| 8 days | 85.4 | 101.7 | 109.6 | 120.5 | 127.3 | 132.4 | 147.9 | 163.7 | 173.5 | 186.3 | 197.1 | 205.1 | 216.8 | 225.6 | 232.6 | 255.7 |
| 10 days | 98.6 | 116.6 | 125.1 | 136.9 | 144.4 | 149.9 | 166.6 | 183.6 | 194.0 | 207.7 | 219.1 | 227.6 | 240.0 | 249.2 | 256.6 | 280.9 |
| 12 days | 111.4 | 130.9 | 140.1 | 152.8 | 160.8 | 166.7 | 184.5 | 202.5 | 213.5 | 228.0 | 240.1 | 249.0 | 262.0 | 271.7 | 279.4 | 304.8 |
| 16 days | 136.4 | 158.6 | 169.1 | 183.3 | 192.3 | 198.8 | 218.6 | 238.6 | 250.7 | 266.6 | 279.8 | 289.5 | 303.7 | 314.1 | 322.5 | 349.8 |
| 20 days | 160.8 | 185.5 | 197.0 | 212.7 | 222.5 | 229.7 | 251.3 | 273.0 | 286.1 | 303.2 | 317.4 | 327.8 | 343.0 | 354.2 | 363.1 | 392.2 |
| 25 days | 190.8 | 218.3 | 231.1 | 248.5 | 259.2 | 267.2 | 290.8 | 314.4 | 328.7 | 347.2 | 362.5 | 373.7 | 390.0 | 402.0 | 411.5 | 442.6 |

## 9.3.6 Summary of Flood Risk Assessment

A flood risk assessment of the Proposed Development site is presented in **Appendix 9-1**. OPW's flood risk maps (https://www.floodinfo.ie/map/floodmaps/) and OSI's historical 6-inch sheets and 25-inch basemaps were consulted to identify if any part of the Proposed Development site may be at risk of fluvial flooding.

Summarised in **Figure 9-6**, the National Indicative Fluvial flood risk map shows a "*medium probability*" of fluvial flooding downstream and outside of the Proposed Development site. Based on the accompanying text to the flood risk map, the "*Medium probability"* extent of flooding is a *"modelled extent of land that might be flooded by rivers (fluvial flooding) during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past.*" In this instance, the probably of occurrence is 100:1, *i.e.*, a 100-year return period event, noting that it does not account for possible effects of climate change.

Historical OSI 6- or 25-inch sheets for the Proposed Development site do not identify any lands that are "*liable to flood*". GSI's groundwater flooding probability maps also do not indicate a groundwater flood risk within or downgradient of the site.

All Proposed Development infrastructure is located outside and above the mapped 1,000-year flood level and, therefore, all infrastructure is located in Flood Zone C (Low Risk).

There are no recorded recurring flood events on Sheskin River specifically within or immediately downstream of Sheskin Forest (**Figure 9-6**). The nearest mapped flood event is on the Owenmore River at a location near Bangor Erris. At this location, OPW's flood incident reporting[4] describes the river overflowing its banks on 12 July 1997 after 49.5 mm of rain had fallen in Bangor Erris over just a 2-hour period. Based on **Table 9-8**, this would equate to a 100-year rainfall event. The same reporting also refers to "*small landslides*" along the river.

[4] https://www.floodinfo.ie/map/pf_addinfo_report/2438/

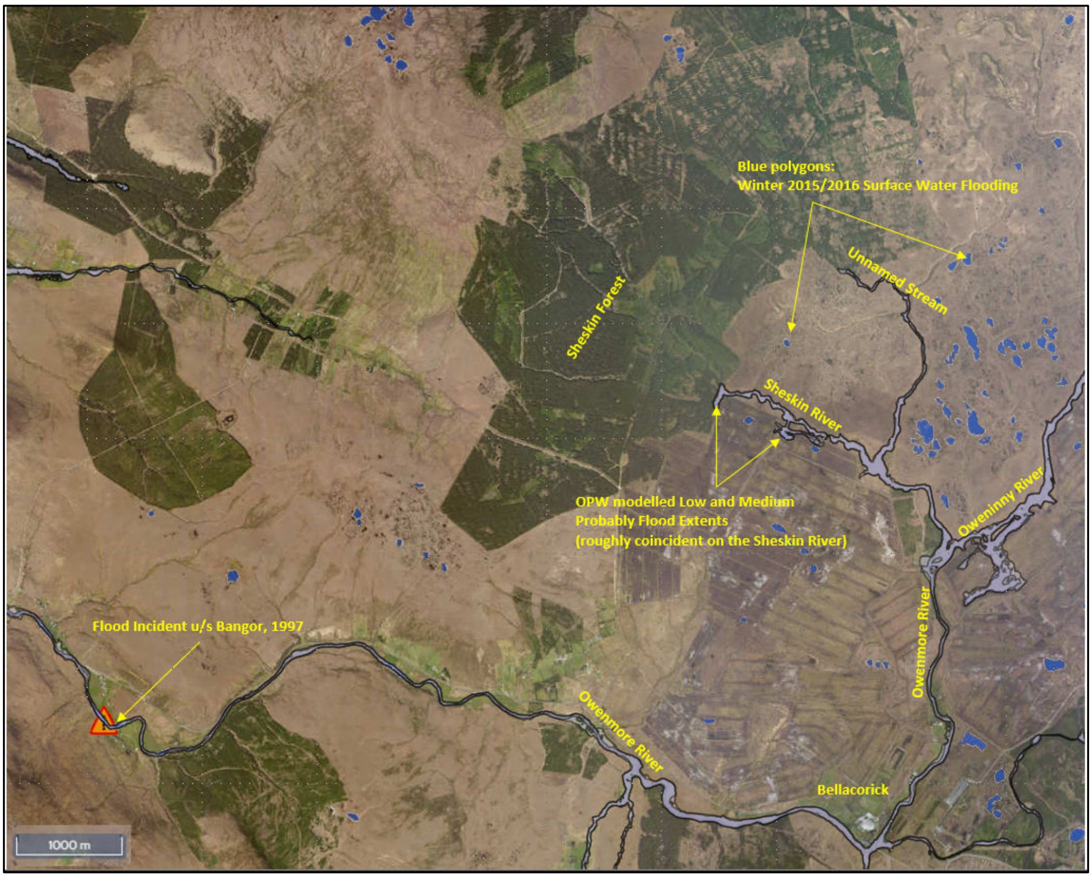


*Figure 9-6 Extent of "Medium Probability" Flood Risk*

## 9.3.7 Surface Water Quality

Surface water sampling was conducted by Tobin Consulting Engineers (TCE) in December 2020 and April, July, and August 2021. Sample locations are reproduced in **Figure 9-7**, and include:

- The Sheskin River downstream of the Proposed Development site, labelled as "Sheskin".
- The Owenmore River after the confluence with the Oweninny River, labelled as "Oweninny".
- The unnamed stream south of Sheskin forest, labelled as "701".
- Individual tributaries of Sheskin River within the Proposed Development site, e.g., "704" and "705".

The available data for "Sheskin", "Oweninny" and "701" are presented **Table 9-9**, reflecting the main streams associated with the site. The available data for tributary locations are presented in **Table 9-10**. The data from the referenced sampling events do not indicate any significant water quality issues.

- Suspended solids concentrations were less than 25mg/l in all analysed samples, which is the threshold value cited in the European Communities (Quality of Salmonid Waters) Regulations (S.I. No. 293 of 1988).
- One single detection of orthophosphate at 0.064 mg/l (as PO4) was recorded at location "701" (value in bold in **Table 9-9**) which exceeded the annual average (AA) environmental quality standard (EQS) and 95-percentile EQS for both "High" and "Good" chemical status in the surface water regulations (S.I. No. 77 of 2019), but as an individual detection, not an AA or 95-percentile concentration.
- Ammonium as $NH_4$ was reported at 0.19 mg/l in one sample at location "702" (value in bold in **Table 9-9**). Converted to $NH_3$-N, this is equivalent to 0.179 mg/L, which exceeds both the

AA-EQS and 95-percentile EQS for ammonia (as $NH_3$) for both “High” and “Good” chemical status in the surface water regulations. However, this was a single value, not an AA or 95-percentile value.

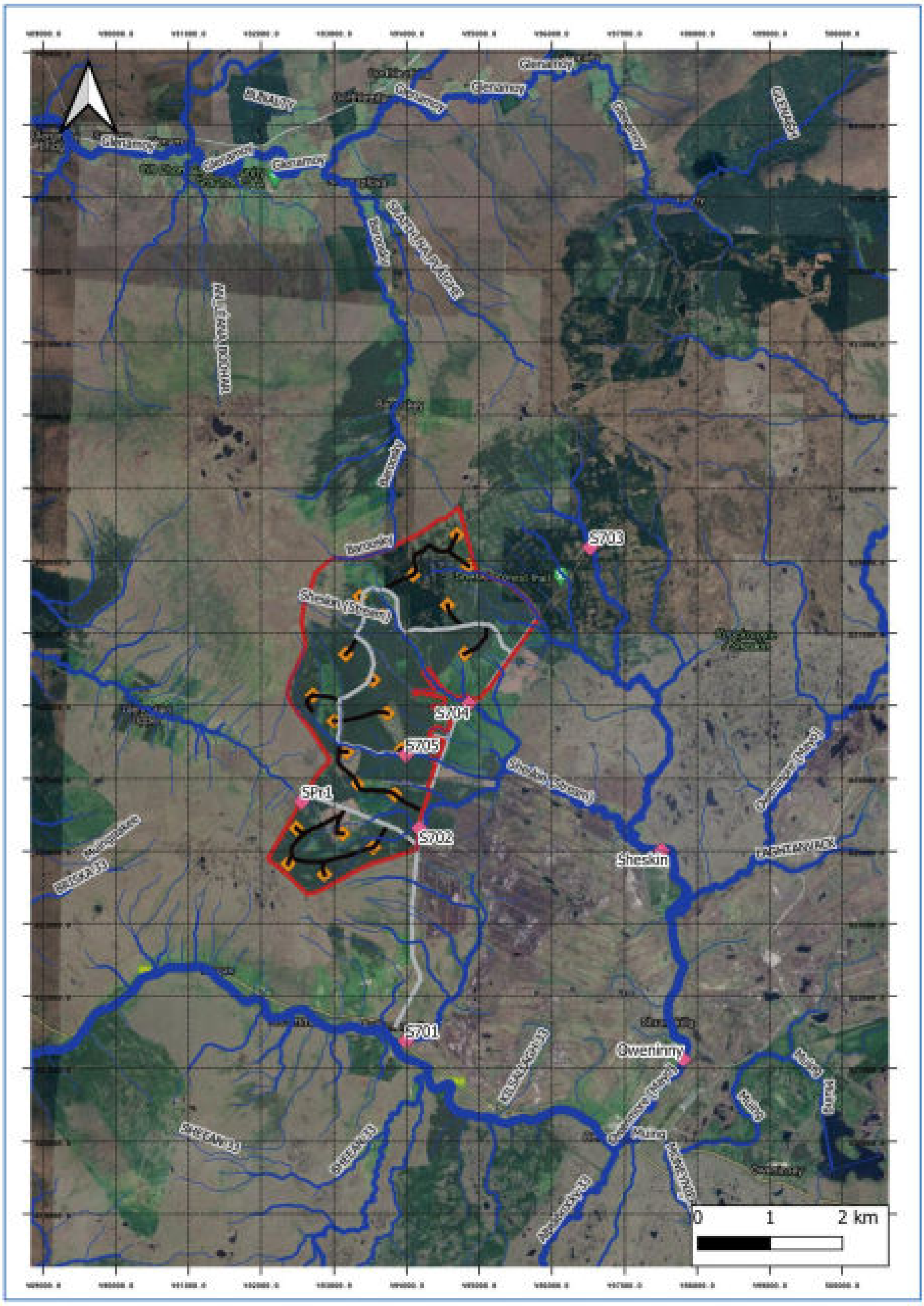


*Figure 9-7 Surface Water Sampling Locations For This EIAR (Source: TCE 2021)*

*Table 9-9 Surface Water Sample Results, Main Streams (Source: TEC, 2021)*

| | | 701 | | | | Sheskin | | | | Oweninny | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Units** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** |
| pH | pH units | 7.7 | 8.1 | 8.1 | 7.8 | 7.7 | *ns* | 7.8 | *ns* | 7.9 | 7.9 | 7.8 | 8 |
| Suspended Solids | mg/l | 10 | <5 | 11 | <5 | <5 | *ns* | 7 | *ns* | 12 | <5 | 18 | <5 |
| Turbidity | NTU | *na* | *na* | 17 | *na* | *na* | *ns* | 10 | *ns* | *na* | *na* | 20 | *na* |
| Ammonium ($NH_4$) | mg/l | <0.05 | <0.03 | <0.05 | <0.03 | <0.05 | *ns* | <0.05 | *ns* | <0.05 | <0.03 | <0.05 | <0.03 |
| Nitrate | mg/l | <0.5 | *na* | <0.5 | *na* | <0.5 | *ns* | 1.6 | *ns* | <0.5 | *na* | 0.61 | *na* |
| Nitrite | mg/l | *na* | <0.01 | *na* | *na* | *na* | *ns* | *na* | *ns* | *na* | <0.01 | *na* | *na* |
| Phosphorus (Total) | mg/l | 0.021 | <0.1 | 0.029 | <0.1 | <0.02 | *ns* | 0.021 | *ns* | <0.02 | <0.1 | 0.021 | <0.1 |
| Orthophosphate (as $PO_4$) | mg/l | **0.064** | *na* | *na* | <0.02 | <0.05 | *ns* | *na* | *ns* | <0.05 | *na* | *na* | <0.02 |
| Dissolved Organic Carbon | mg/l | 19 | *na* | *na* | *na* | 16 | *ns* | *na* | *ns* | 17 | *na* | *na* | *na* |
| Specific Electrical Conductivity | µS/cm | *na* | 132 | 150 | 142 | na | *ns* | 140 | *ns* | *na* | 134 | 200 | 151 |
| Chloride | mg/l | 21 | 26 | 21 | 22.5 | 16 | *ns* | 19 | *ns* | 17 | 24.9 | 22 | 19.7 |
| Chemical Oxygen Demand | mg-$O_2$/l | *na* | 33 | <10 | *na* | *na* | *ns* | 54 | *ns* | *na* | 32 | 37 | *na* |
| *Note: na = not analysed/reported; ns = not sampled* | | | | | | | | | | | | | |

*Table 9-10 Surface Water Sample Results, Tributaries of Sheskin River (Source: TEC, 2021)*

| | | 702 | | | | 703 | | | | 704 | | | | 705 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Units** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** | **Dec-20** | **Apr-21** | **Jul-21** | **Aug-21** |
| pH | pH units | *ns* | 8 | 8 | 7.8 | 7.8 | *ns* | 7.9 | *ns* | *ns* | *ns* | 7.7 | *ns* | 7.6 | *ns* | 7.7 | *ns* |
| Suspended Solids | mg/l | *ns* | <5 | <5 | <5 | <5 | *ns* | <5 | *ns* | *ns* | *ns* | 14 | *ns* | <5 | *ns* | 6 | *ns* |
| Turbidity | NTU | *ns* | *na* | 2.7 | *na* | *na* | *ns* | 6 | *ns* | *ns* | *ns* | 21 | *ns* | *na* | *ns* | 9 | *ns* |
| Ammonium ($NH_4$) | mg/l | *ns* | <0.03 | **0.19** | <0.03 | <0.05 | *ns* | <0.05 | *ns* | *ns* | *ns* | <0.05 | *ns* | <0.05 | *ns* | <0.05 | *ns* |
| Nitrate | mg/l | *ns* | *na* | 15 | *na* | <0.5 | *ns* | <0.5 | *ns* | *ns* | *ns* | <0.5 | *ns* | <0.5 | *ns* | <0.5 | *ns* |
| Nitrite | mg/l | *ns* | <0.01 | *na* | *na* | *na* | *ns* | | *ns* | *ns* | *ns* | *na* | *ns* | *na* | *ns* | *na* | *ns* |
| Phosphorus (Total) | mg/l | *ns* | <0.1 | 0.031 | <0.1 | <0.02 | *ns* | 0.5 | *ns* | *ns* | *ns* | 0.32 | *ns* | <0.02 | *ns* | 0.25 | *ns* |
| Orthophosphate (as $PO_4$) | mg/l | *ns* | *na* | *na* | <0.02 | <0.05 | *ns* | *na* | *ns* | *ns* | *ns* | *na* | *ns* | <0.05 | *ns* | *na* | *ns* |
| Dissolved Organic Carbon | mg/l | *ns* | *na* | *na* | *na* | 16 | *ns* | *na* | *ns* | *ns* | *ns* | *na* | *ns* | 23 | *ns* | *na* | *ns* |
| Specific Electrical Conductivity | µS/cm | *ns* | 107 | 120 | 140 | *na* | *ns* | 120 | *ns* | *ns* | *ns* | 96 | *ns* | *na* | *ns* | 130 | *ns* |
| Chloride | mg/l | *ns* | 28.3 | 31 | 20.7 | 17 | *ns* | 16 | *ns* | *ns* | *ns* | 17 | *ns* | 22 | *ns* | 18 | *ns* |
| Chemical Oxygen Demand | mg-$O_2$/l | *ns* | 47 | <10 | *na* | *na* | *ns* | 14 | *ns* | *ns* | *ns* | 23 | *ns* | *na* | *ns* | 16 | *ns* |
| *Note: na = not analysed/reported; ns = not sampled* | | | | | | | | | | | | | | | | | |

A more detailed and longer-term dataset of water quality of the Sheskin River is available from EPA for a WFD sampling station (RS33S030150) which is labelled on **Figure 9-2** and located close to "Sheskin" in **Figure 9-7**. EPA has monitored this location for WFD reporting purposes since 2007, and the data are summarised in **Table 9-11**. The water quality at this location represents both of the subcatchments that drain from the Proposed Development site.

*Table 9-11 Summary of EPA Water Quality Data, WFD Monitoring Location RS33S030150, 2007-2022*

| Parameter | Unit | Min. | Max. | No. Samples | No. Detections | Mean | AA-EQS[1] (mg/l) |
|---|---|---|---|---|---|---|---|
| Total Ammonia ($NH_3$-N) | mg/l | <0.2 | 0.05 | 58 | 10 | 0.015 | ≤0.040 |
| Nitrate (as N) | mg/l | <0.2 | 0.63 | 32 | 1 | Nc[2] | -- |
| Nitrite[3] (as N) | mg/l | <0.005-<4 | 14 | 67 | 1 | Nc[2] | -- |
| Total Oxidised Nitrogen (as N) | mg/l | <0.2 | 0.62 | 68 | 1 | Nc[2] | -- |
| Orthophosphate (as P) | mg/l | <0.01 | 0.085 | 68 | 16 | 0.0086 | ≤0.025 |
| pH | -- | 5 | 8.2 | 68 | 68 | 6.93 | -- |
| Alkalinity (as $CaCO_3$) | mg/l | <8 | 90 | 68 | 49 | 26.5 | -- |
| True Colour | Hazen or mg/l Pt co | 49 | 436 | 68 | 68 | 187.2 | -- |
| Total Hardness (as $CaCO_3$) | mg/l | 17 | 98 | 68 | 59 | 39.8 | -- |
| Chloride | mg/l | 14.3 | 47.1 | 68 | 60 | 24.2 | -- |
| Electrical Conductivity | µS/cm | 66 | 270 | 68 | 68 | 140 | -- |
| $BOD_5$ | mg/l | <1 | 4.1 | 68 | 33 | 0.9 | ≤1.3 |
| Notes:<br>[1]Annual average EQS for nutrients for WFD High Status classification | | | | | | | |
| [2] Not calculated for nitrogen compounds due to a large number of non-detects | | | | | | | |
| [3]Wide range of limits of detection | | | | | | | |

The water at EPA sampling station RS33S030150 (**Figure 9-2**) is characterised by low nutrient concentrations, low alkalinity and total hardness, low salinity, and generally low biological oxygen demand ($BOD_5$). Moreover, the mean concentrations for total ammonia, orthophosphate (ORP), and $BOD_5$ are all below respective AA-EQSs for "High" chemical status. WFD status of water bodies in and around the Proposed Development site are described further in **Appendix 9-4**.

Details of detections for total ammonia and true colour, which are two relevant parameters of concern in peat settings, are plotted in **Figure 9-8** and **Figure 9-9**, respectively.

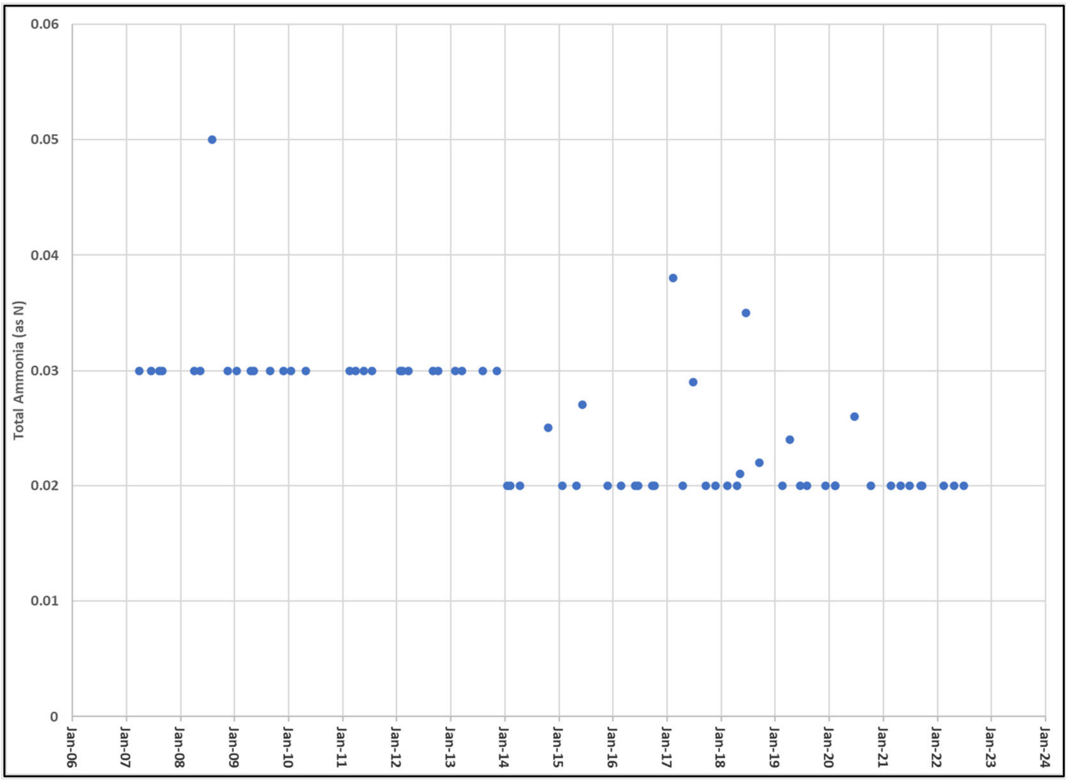


*Figure 9-8 Total Ammonia Concentrations, Sheskin River, 2007-2022*

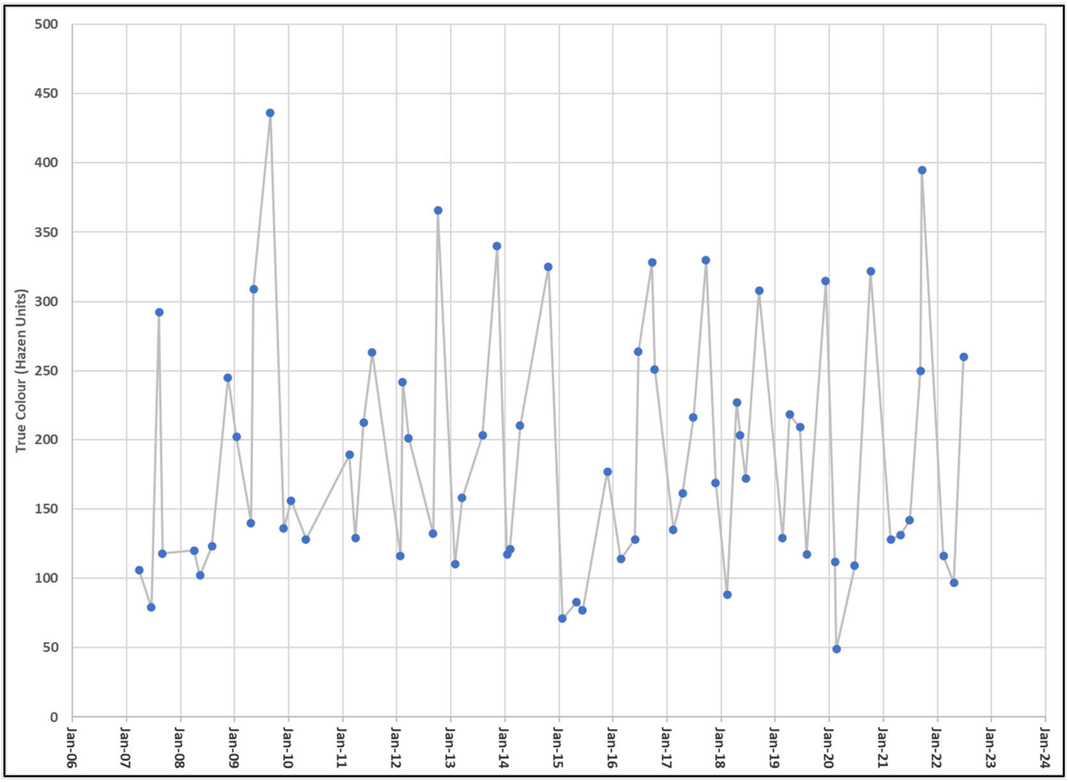

*Figure 9-9 True Colour Concentrations, Sheskin River, 2007-2022*

Total ammonia concentrations are generally below their reported limits of detection (LOD), which is either <0.03 or <0.02 mg/l in the period of record. There are relatively few detections and the majority of detections are noted in summer. The maximum recorded value was single detection of 0.05 mg/l in 2008.

True colour, as a proxy of fine suspended matter, ranged between 49 and 436 mg/l over the period of record, with seasonal maximum values generally occurring in autumn. There is no EQS for true colour, but elevated concentrations reflect releases of organic matter (dissolved organic carbon) from humic matter such as peat.

Plots of two other relevant parameters, pH and orthophosphate, are shown in **Figure 9-10** and **9-11** (next page) respectively. pH values range from 5 to 8.2, with summer maxima. Orthophosphate is generally below the LOD (0.01 or 0.012 mg/L-P for most samples), with few, sporadic (scattered) detections over the period record.

In addition to the WFD water quality monitoring, EPA conducts biological monitoring through macroinvertebrate 'kick-sampling' at the same fixed water quality sampling locations on the Sheskin River. The resulting 'Q rating' is consistently high (4 to 5), implying favourable High status biological conditions.

## 9.3.8 Hydrogeology

Based on GSI's bedrock mapping, the Proposed Development site is underlain by sandstones and siltstones of the Downpatrick Formation (**Figure 8-2**). This is bounded to the north by sandstones and siltstones of the Minnaun Sandstone Formation. The two sandstone formations are faulted against each other. Faulting trends northeast-southwest. There are no apparent surface manifestations of the faults and it is not inferred that faults or bedrock geology influence the site's drainage patterns.

As shown in **Figure 9-12**, the Downpatrick Formation is hydrogeologically considered by GSI as a 'Pl' bedrock aquifer, which is a "*poorly productive bedrock aquifer which is generally unproductive except for local zones*". In poorly productive bedrock aquifers, the term 'local zones' usually refers to geological faults.

The Minnaun Sandstone Formation to the north is classified as an 'Lm' aquifer, which per GSI's classification system is "*locally important*" and "*generally moderately productive*".

In both cases, groundwater flow in bedrock is expected to be via fractures, with flow directions that mimic topography. In poorly productive bedrock settings, groundwater flow cells tend to be localised, a few hundreds of metres only. Hence, groundwater flow is expected to discharge locally to the many small streams. Runoff will be the dominant water (and pollutant) transport mechanism.

The bedrock is overlain by natural subsoils. According to GSI mapping, ground is covered by blanket peat and fen peat across the Proposed Development site (**Figure 8-1**). Small pockets of underlying glacial till (derived from bedrock beneath) are exposed along streams that cut through the peat, thereby exposing subsoils along streambeds.

As described in Chapter 8, trial pits were excavated which confirmed the presence of till beneath the peat. The till is described as "*granular*" and "*cohesive*" (Chapter 8), comprising "*silty sands and gravels and/or slightly gravelly sandy silt with cobbles and boulders*" (IDL, 2022).

Recorded peat thicknesses across the Proposed Development site range from 0.2 to 5.7 m, with an average peat depth of 2.1m. Of 960 no. peat probes and measurements along tracks, 53% of recorded peat depths were less than 2.0m and 83% were less than 3.0 m (FT, 2022). As noted in Chapter 8, the peat thickness at each infrastructure component location ranged from 0.6 to 3.0 m. One peat pipe was recorded at a location in the southwest, by a spring near the boundary with the Carrowmore Lake Complex SAC.

The trial pits at infrastructure component locations reached depths of approximately 4 metres below ground level (mbgl). The minimum depth to bedrock recorded was 0.9 m but most of the trial pits did not encounter bedrock.

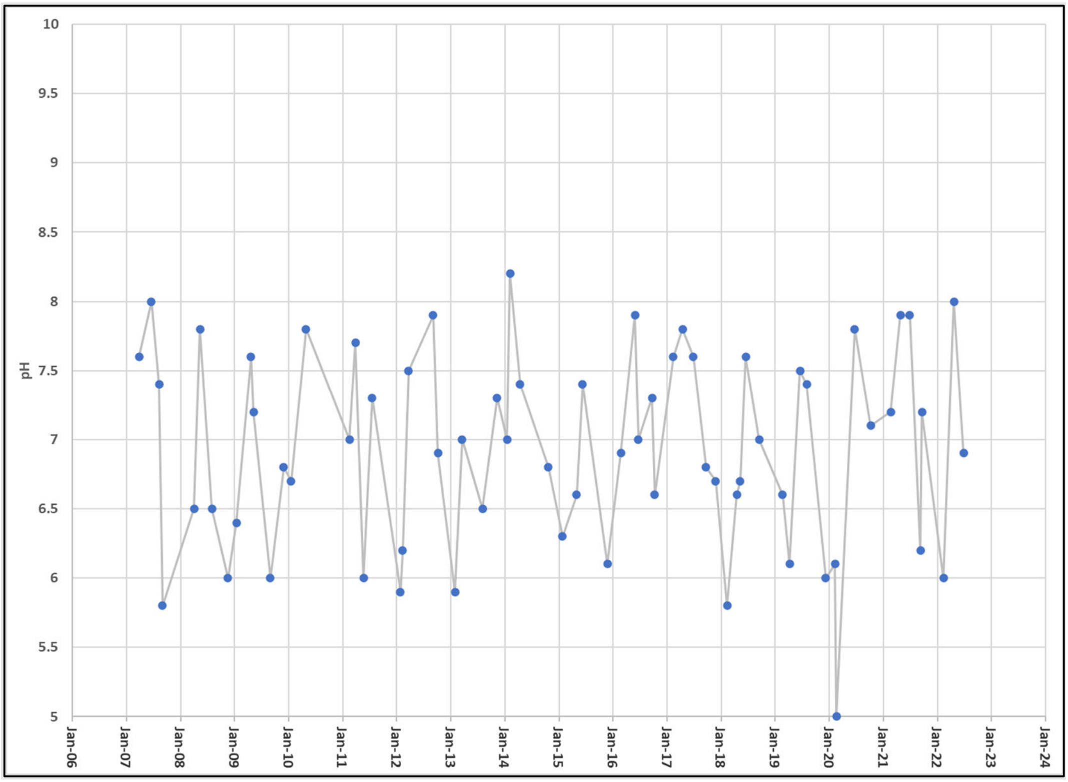


*Figure 9-10 pH Values, Sheskin River, 2007-2022*

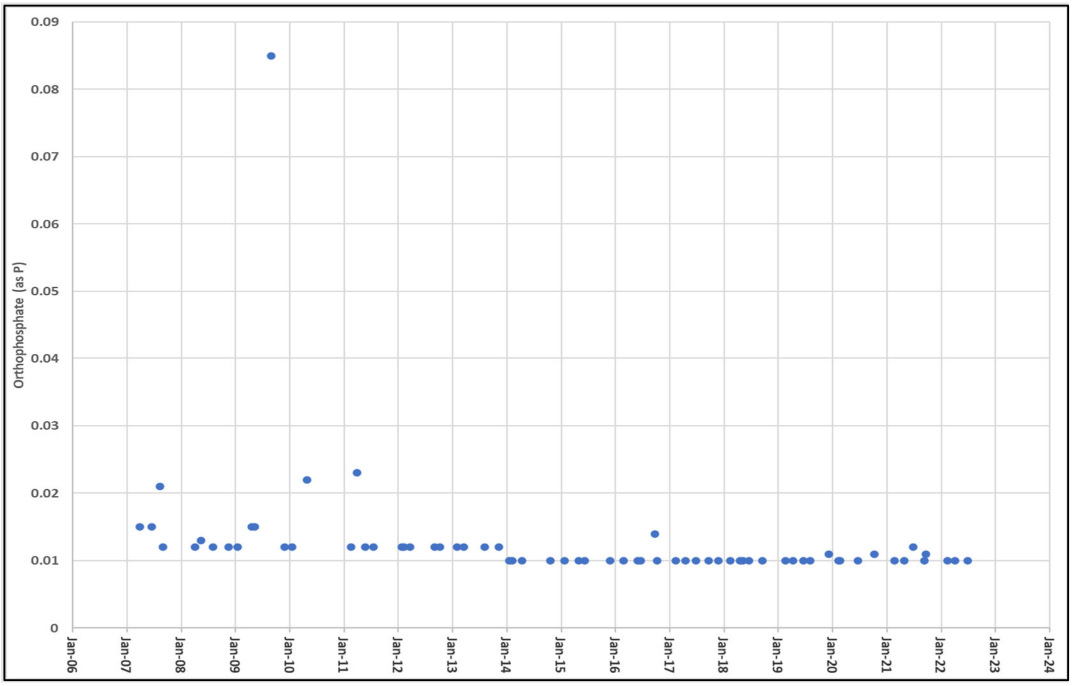


*Figure 9-11 ORP Concentrations, Sheskin River, 2007-2022*

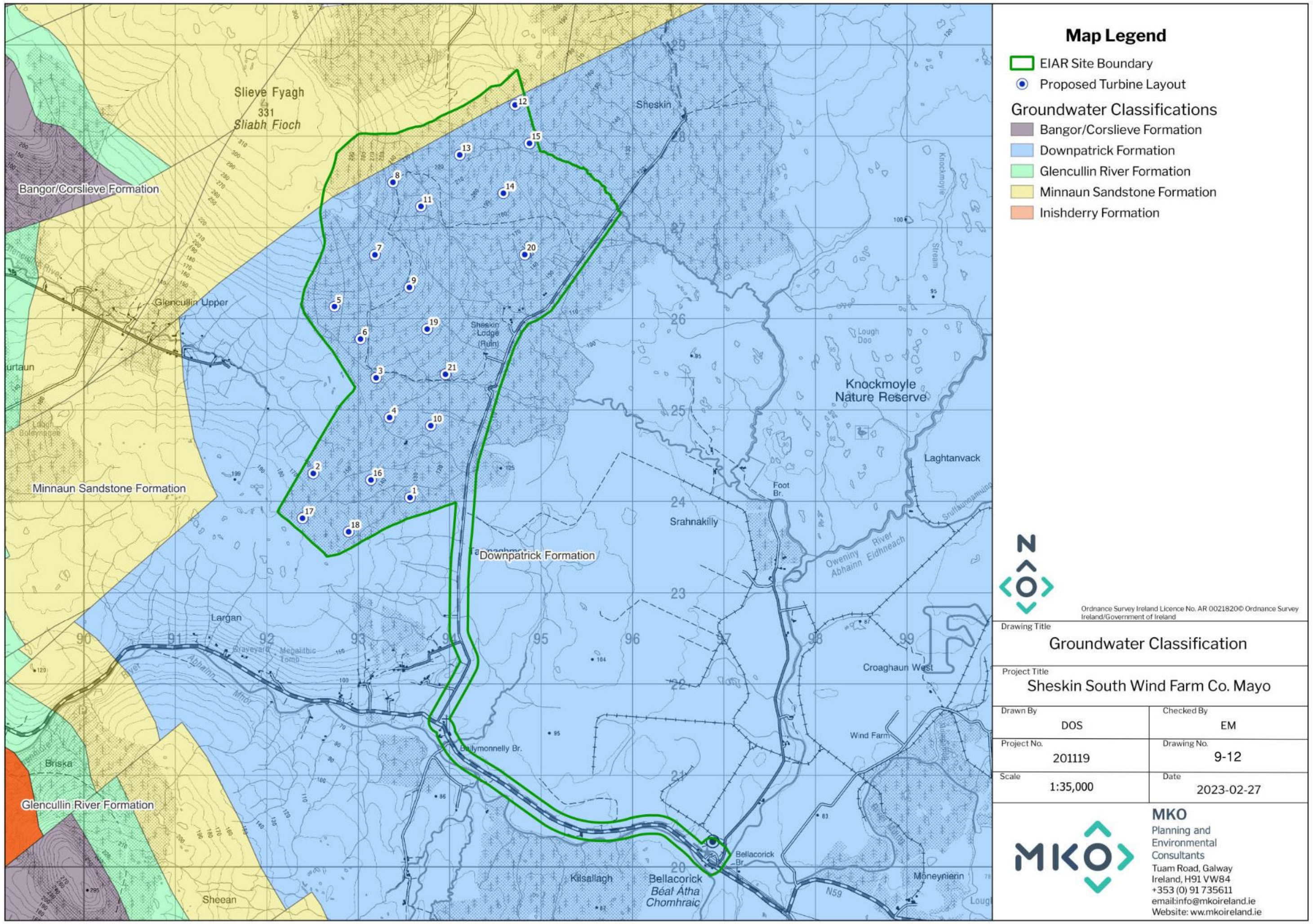


*Figure 9-12 Bedrock Aquifer Classification Map*

Trials pits also recorded "*ingress of water*" below peat in subsoils at depths between 0.5 and 3.1 mbgl, which is likely associated with more permeable lenses within the subsoils, possibly near the contacts between the peat and till. Several of the trial pits could not be kept open – notably, sidewalls collapsed "*due to ingress of water*" (IDL, 2022). This means that sub-peat groundwater movement takes place, likely locally via thin sand and gravel lenses or channels within the till.

Conceptually, the shallow groundwater in bedrock is hydraulically connected with groundwater in subsoils, which includes movement of groundwater via the 'transition zone' at the top of rock (Moe *et al.* 2010).

Baseline monitoring of water levels in 16 no. peat piezometers across the Proposed Development site between August 2020 and August 2021 recorded depths to water that ranged from 0.1 to 1.0 mbgl (**Figure 9-13**). Water level fluctuations ranged between <0.1 and 0.6 m (TCE, 2021). Responses were broadly similar, with the lowest water levels in August and highest water levels in January through March. In **Figure 9-13**, the secondary y-axis on the right is daily rainfall in mm.

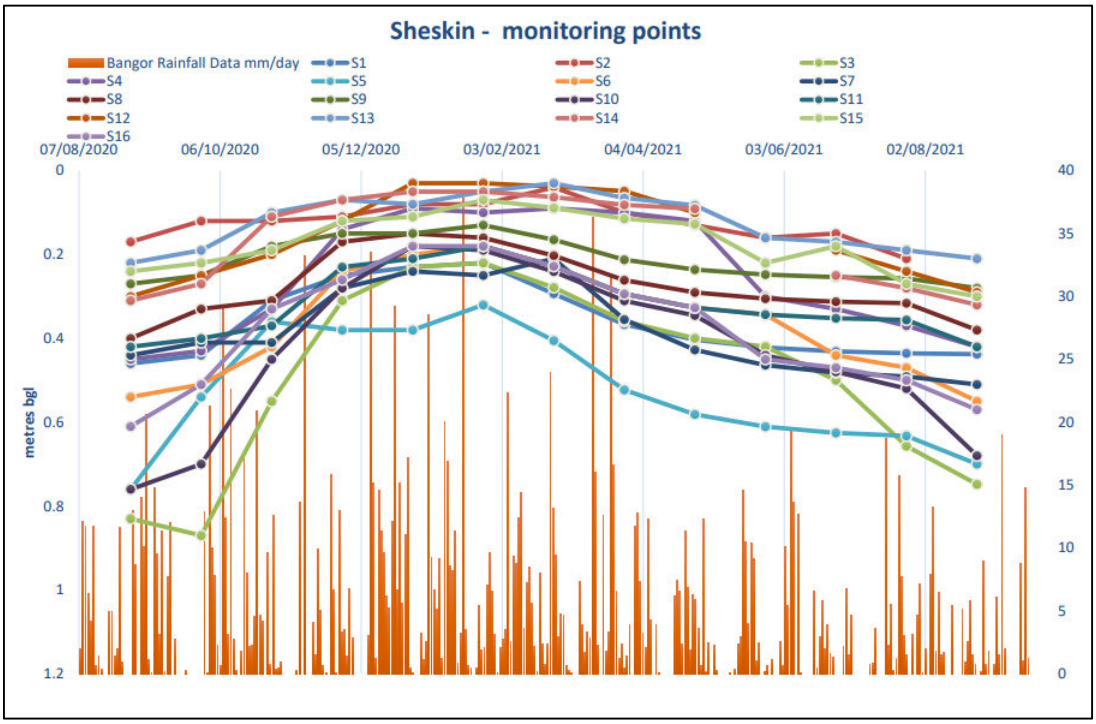


*Figure 9-13 Water Level Fluctuations in Peat Piezometers, Proposed Development Site, August 2020-August 2021 (Source: TCE, 2021)*

Water levels in peat piezometers that were installed along the cable grid route show similar behaviour as shown in **Figure 9-14** (the y-axis is mbgl. Some of the water levels in both sets of piezometers are relatively deep in summer months, potentially below the 'acrotelm' (active peat layer).

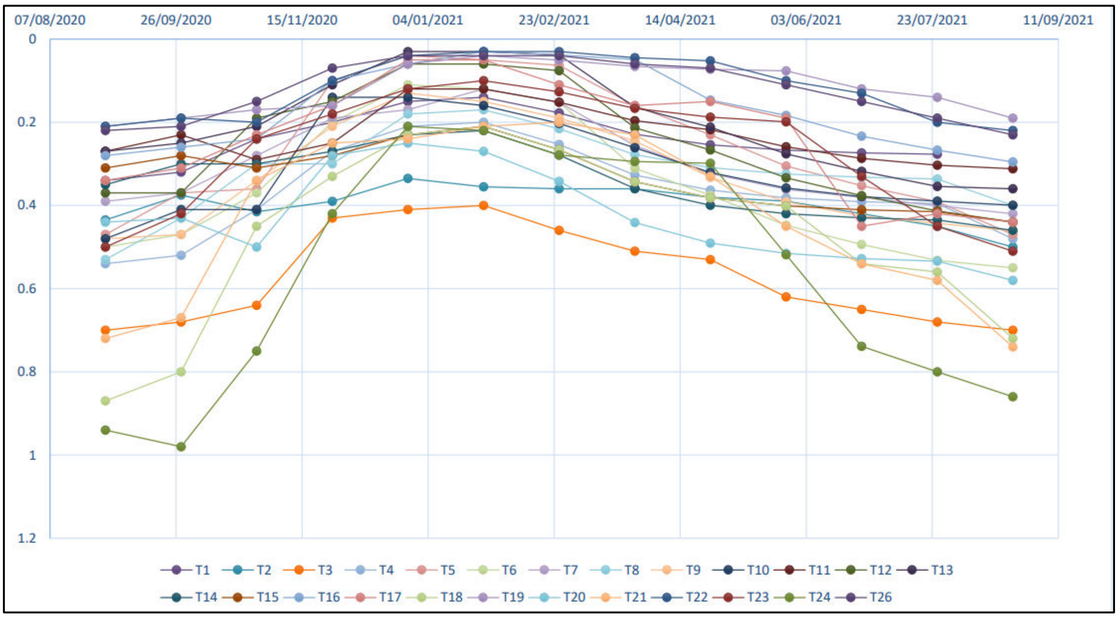


*Figure 9-14 Water Level Fluctuations in Peat Piezometers, Proposed Development Site, August 2020-August 2021 (Source: TCE, 2021)*

## 9.3.8.1 Groundwater Vulnerability

Groundwater vulnerability within the site is predominantly mapped by GSI as “High” (**Figure 9-15**). Subsoil permeability is indicated as “Moderate” which means the vulnerability category assumes or is further based on depths to bedrock between 3 and 10 m (DELG/EPA/GSI, 1999). Depth to bedrock greater than 3 m is mostly supported by the site specific information from the trial pits referenced above.

Along one of the tributaries of Sheskin River, groundwater vulnerability is mapped as ‘Extreme’. This is where peat and till have been cut through by the stream and bedrock is closed to surface or exposed along the streambed.

On the lower (eastern) slopes of the site and the offsite areas to the east, groundwater vulnerability is mapped as Moderate and Low, which is linked to greater subsoil thicknesses and/or lower permeability characteristics.

## 9.3.9 Public and Private Water Supply

There are no surface water or groundwater abstractions used for public water supply purposes directly within or hydrologically downgradient of the Proposed Development area. The nearest source of public water supply is Carrowmore Lough, approximately 7 km to the west of Sheskin Forest. This serves approximately 3,900 people in Bangor Erris, Belmullet, and surrounding areas. It also provides treated drinking water to three public group water schemes (LAWPRO, 2020).

Carrowmore Lough receives surface water from rivers/streams that drain from the northern and western slopes of Slieve Fynagh. As such, Carrowmore Lough is not connected or influenced by the Proposed Development site and is, therefore, not at risk of pollution from the Proposed Development.

There are private dwellings, farms and commercial enterprises within the broader Owenmore River catchment. These have access to public water supply but it cannot be ruled out that they also have private supply wells (or ‘boreholes’). The nearest dwellings are south of the site, along the N59 and at Shranakilly, near the confluence of the Sheskin and Oweninny Rivers and west of the site in the townland of Glencullin Upper.

As described previously, groundwater flow is localized, with short flow paths to nearby streams. As such, it is considered implausible that any private wells can be affected by site activity. That said, groundwater can function as localized, shallow pathways to nearby small streams within the Proposed Development site during the construction phase.

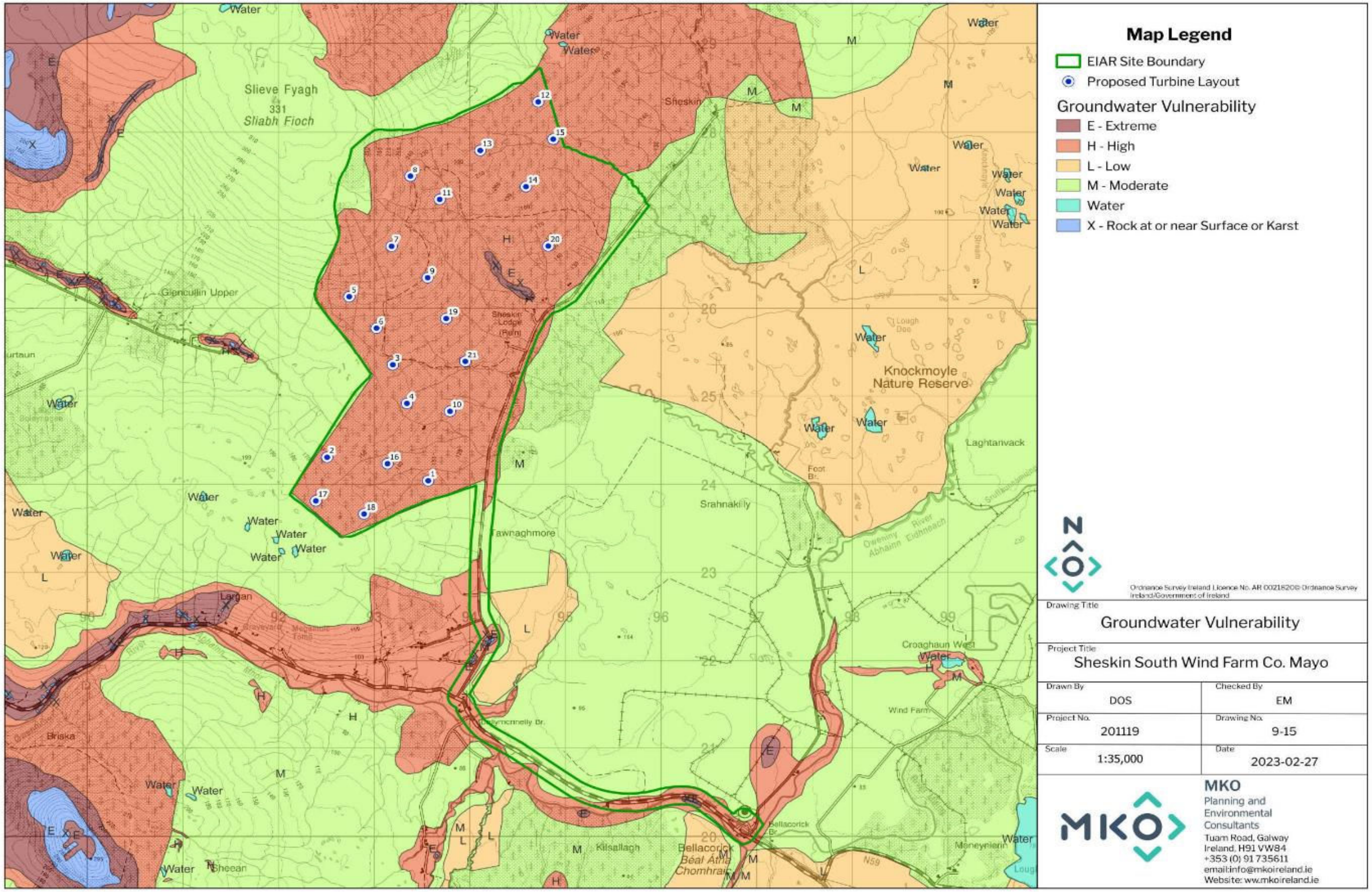


*Figure 9-15 Groundwater Vulnerability Map*

## 9.3.10 Designated Sites and Protected Areas

The potential for the Proposed Development to impact on designated sites and habitats was considered, comprising:

- Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs), which are designated under the EU Habitats Directive and EU Birds Directive, respectively. SACs and SPAs are collectively referred to as 'European Sites'.
- Natural Heritage Areas (NHAs), which are designated under Section 18 the Wildlife (Amendment) Act 2000.
- Proposed Natural Heritage Areas (pNHAs), which are designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated.

The source-pathway-receptor model of environmental risk assessment served to guide the determination about which sites may be affected by the Proposed Development. Mainly, to be affected, the designated sites have to be judged to be hydrologically or hydrogeologically linked to the Proposed Development via surface water or groundwater pathways. As well, the designated sites must have qualifying interest (designation features) which are water-dependent. The latter was checked from 'site synopsis' reports prepared by the National Parks and Wildlife Service (NPWS), published on their website (www.npws.ie).

Designated sites which are deemed to be potentially connected with the Proposed Development site hydrologically or hydrogeologically are shown in **Figure 9-16** and summarised in **Table 9-12**. They are:

- Slieve Fyagh Bog Complex SAC
- Carrowmore Lake Complex SAC
- Glenamoy Bog Complex SAC
- Bellacorick Bog Complex SAC
- Owenduff/Nephin SAC/SPA

The Broadhaven Bay SAC is also hydrologically linked to the Proposed Development site via the Owenmore River, but the SAC is considered too distant (>30 km) to be at risk of effect.

Neither the Sheskin or Owenmore Rivers are protected areas. They are not designated bathing waters, drinking water protected areas, or designated freshwater pearl, salmonid or nutrient sensitive waters. The rivers are, however, recognised as being important for fish spawning and recreational fishing (including salmonid species), as described in Chapter 6 of this EIAR.

## 9.3.11 Receptor Importance and Sensitivity

Based on the baseline characterisation, the principal environmental receptors associated with the Proposed Development site are the local streams and Sheskin River that drain from Sheskin Forest to Owenmore River. This includes the local streams that are crossed by the grid connection route.

Neither the local streams nor Sheskin River and its headwater tributaries are designated salmonid rivers, nutrient sensitive water bodies, or within a freshwater pearl mussel catchment. They are also not used for drinking water supply and are no upstream of a designated drinking water protected area.

The local streams and Sheskin River with its tributaries are, however, designated WFD 'High Status' water bodies, and are classified as being at 'High' status for the latest WFD reporting period (2016-2021).

For this reason, the importance and sensitivity of the receptor surface water environment is considered to be “Very High” (from **Table 9-2**). Maintaining the ‘High’ status classification in ‘High’ status objective water bodies is a WFD priority (DHLGH, 2021),

Groundwater provides minor baseflow to streams and is a minor water balance component overall. However, groundwater is part of the environmental supporting conditions of the peat within the Proposed Development site. For this reason, the importance of the groundwater receiving environment is considered to be “Medium” (from **Table 9-3**).

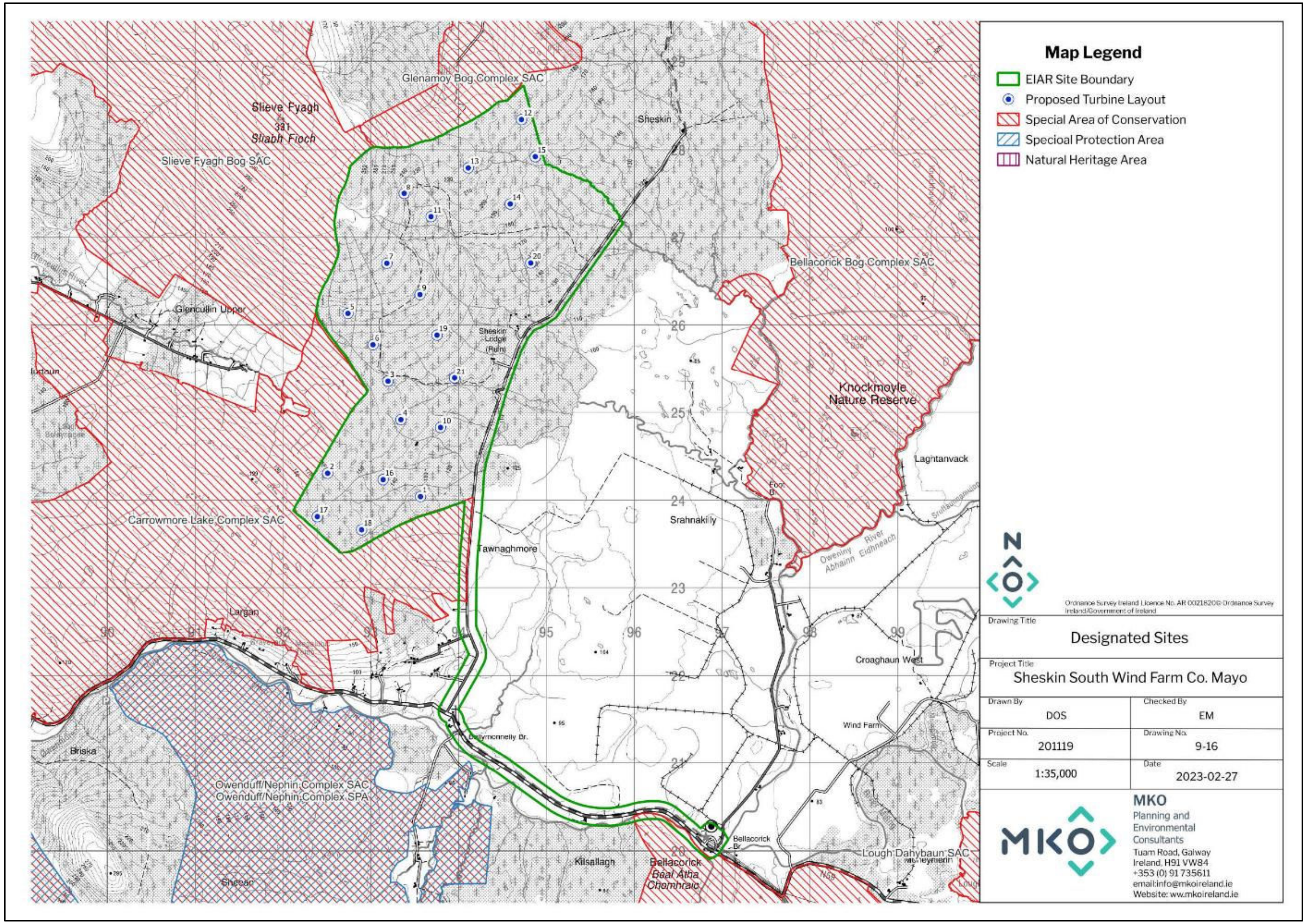


*Figure 9-16 Locations of Designated Sites*

*Table 9-12 Designated Sites – Assessment of Likely Influence*

| Designated Site | Distance from Site Boundary | Likely Zone of Impact Determination |
|---|---|---|
| **Special Areas of Conservation (SAC)** | | |
| Carrowmore Lake Complex SAC [000476] | 0 km (adjacent, upslope) | The designated site is located approximately 200m away from the nearest proposed works. There will be no direct effects as the footprint of the Proposed Development is outside the designated site and there are no pathways or surface water linkages in a downstream direction of any works.<br>Due to the proximity of the SAC to the grid connection route, there is potential for water pollution and hence there is potential of deterioration of qualifying interest (QI) habitats and supporting habitats for QI species within this SAC during the construction phase.<br>From a hydrological and hydrogeological perspective, there is a potential for indirect effects on water and water-related habitats from proposed drainage. For this reason, further assessment is required. |
| Slieve Fyagh Bog SAC [000542] | 0 km (adjacent, upslope) | The designated site is located approximately 250m away from the nearest proposed works. There will be no direct effects as the footprint of the Proposed Development is outside the designated site and there are no pathways or surface water linkages in a downstream direction of any works.<br>From a hydrological and hydrogeological perspective, there is potential for effects on water and water-related habitats from proposed drainage. For this reason, further assessment is required. |
| Glenamoy Bog Complex SAC [000500] | 0 km (adjacent, upslope) | The designated site is located approximately 300m away from the nearest proposed works. There will be no direct effects as the footprint of the Proposed Development is outside the designated site and there are no pathways or surface water linkages in a downstream direction of any works.<br>From a hydrological and hydrogeological perspective, there is a potential for indirect effects on water and water-related habitats from proposed drainage. For this reason, further assessment is required. |
| Bellacorick Bog Complex SAC [001922] | ~2 km (east) | There will be no direct effects as the footprint of the Proposed Development is outside the designated site.<br>There is potential for water pollution of the Owenmore River which forms the western border of the SAC. However, there is no potential for water pollution within the SAC given the distance from the site.<br>There are other wind farms in place within the SAC. For this reason, further assessment is required (cumulative effects). |
| Owenduff/Nephin Complex SAC [000534] | South of Owenmore River | There will be no direct effects as the footprint of the Proposed Development is outside the designated site.<br>There is potential for water pollution of the Owenmore River which forms the northern border of the SAC. However, there is no potential for water pollution within the SAC given the hydraulic separation and distance from the site. Nevertheless, because of the proximity of the SAC to the grid connection route on the north side of Owenmore River, further assessment is required. |

| Designated Site | Distance from Site Boundary | Likely Zone of Impact Determination |
|---|---|---|
| Broadhaven Bay SAC [000472] | 13.6 km (straight-line, west) | There will be no direct effects as the footprint of the Proposed Development is outside the designated site.<br>There is only indirect and very remote hydrological connectivity via the Owenmore River and Tullaghan Bay (an estuary). For this reason, further assessment is not required. |
| **Special Protection Area (SPA)** | | |
| Owenduff/Nephin Complex SPA [004098] | South of Owenmore River | There will be no direct effects as the footprint of the Proposed Development is outside the designated site.<br>There is potential for water pollution of the Owenmore River which forms the northern border of the SPA. However, there is no potential for water pollution within the SAC given the hydraulic separation and distance from the site. Nevertheless, because of the proximity of the SPA to the grid connection route on the north side of Owenmore River, further assessment is required. |
| Blacksod Bay/ Broadhaven SPA [004037] | 13.6 km (straight-line, west) | There will be no direct effects as the footprint of the Proposed Development is outside the designated site.<br>The designated site is indirectly hydrologically linked in the downstream direction, but because of the distance involved (more than 30 km), there is an unlikely potential for effects to occur. Any pollutants will be diluted to such an extent that impact will not be perceptible. For this reason, further assessment is not required. |

## 9.3.12 Drainage Planning

To accommodate the Proposed Development, and to serve as a basis for the assessment of likely significant effects, the drainage system that will need to be constructed within the Proposed Development site was planned as presented below and described and shown in **Appendix 4-1** and **Appendix A of Appendix 4-4**.

In short, new drains and swales will be constructed and existing drains will be upgraded and adapted to the needs of the Proposed Development. Interceptor drains will capture greenfield runoff from areas that are upslope of new and existing infrastructure. This water will be discharged in a controlled manner from multiple locations at greenfield runoff rates before diffusely flow across ground and entering streams. Buffered outfalls will also promote percolation of discharge waters across vegetation. The interceptor drains will be integrated as much as possible with existing drains that currently serve the forestry operations.

Interceptor swales will be established downslope of access roads and other infrastructure components to capture 'dirty water' associated with construction activity. This water will be directed to settlement ponds before being discharged in a controlled manner before diffusely entering streams. The swales will remain in place during all subsequent phases of the Proposed Development and will capture runoff from access roads and hardstanding.

The proposed drainage system layout is presented in **Appendix A of Appendix 4-4**. Calculations of runoff rates and pond area requirements are presented in **Appendix 9-3**. Layout and locations of drains, swales, and ponds are dictated by the combined consideration of:

- Topography, making sure the drainage network always transmits water in the downslope direction, even across shallow gradient areas.
- Physical space, between existing or planned features.
- Avoidance of situations where discharges from one drain or pond could be entrained by another in the downslope direction.

Topography in some areas in subtle (e.g. around turbine T3), and it is anticipated that some engineering judgement of final placement/alignment of culverts, swales and settlement ponds will be necessary during construction based on detailed surveying.

A total of seven new culverts at stream crossing will be installed to accommodate the necessary drainage, which is mainly determined by the layout of infrastructure and topography.

To estimate greenfield runoff rates, the Proposed Development site was divided into subcatchments that drain to roads and infrastructure components. Subcatchments were drawn from development layouts and were guided by detailed Lidar survey data (1-m contour intervals). Roads were divided into logical segments guided by their orientations relative to topographic contours and natural streams. The delineated subcatchments are presented in **Figure 9-17**.

Based on calculations (**Appendix 9-3**), settlement ponds will be constructed to sizes that range between <3×5 m and 3×10 m, and will be approximately 1 m deep.

The proposed drainage management approach is detailed in **Appendix 4-4**. Infrastructure, including drains and settlement ponds, will be constructed at least 50 m away from streams, where possible, in order to minimize the potential for effects (e.g., sedimentation and morphological changes) to streams. The layout of the planned infrastructure, water courses and 50 m buffer are shown on the planning-level design drawings in **Appendix A of Appendix 4-4**.

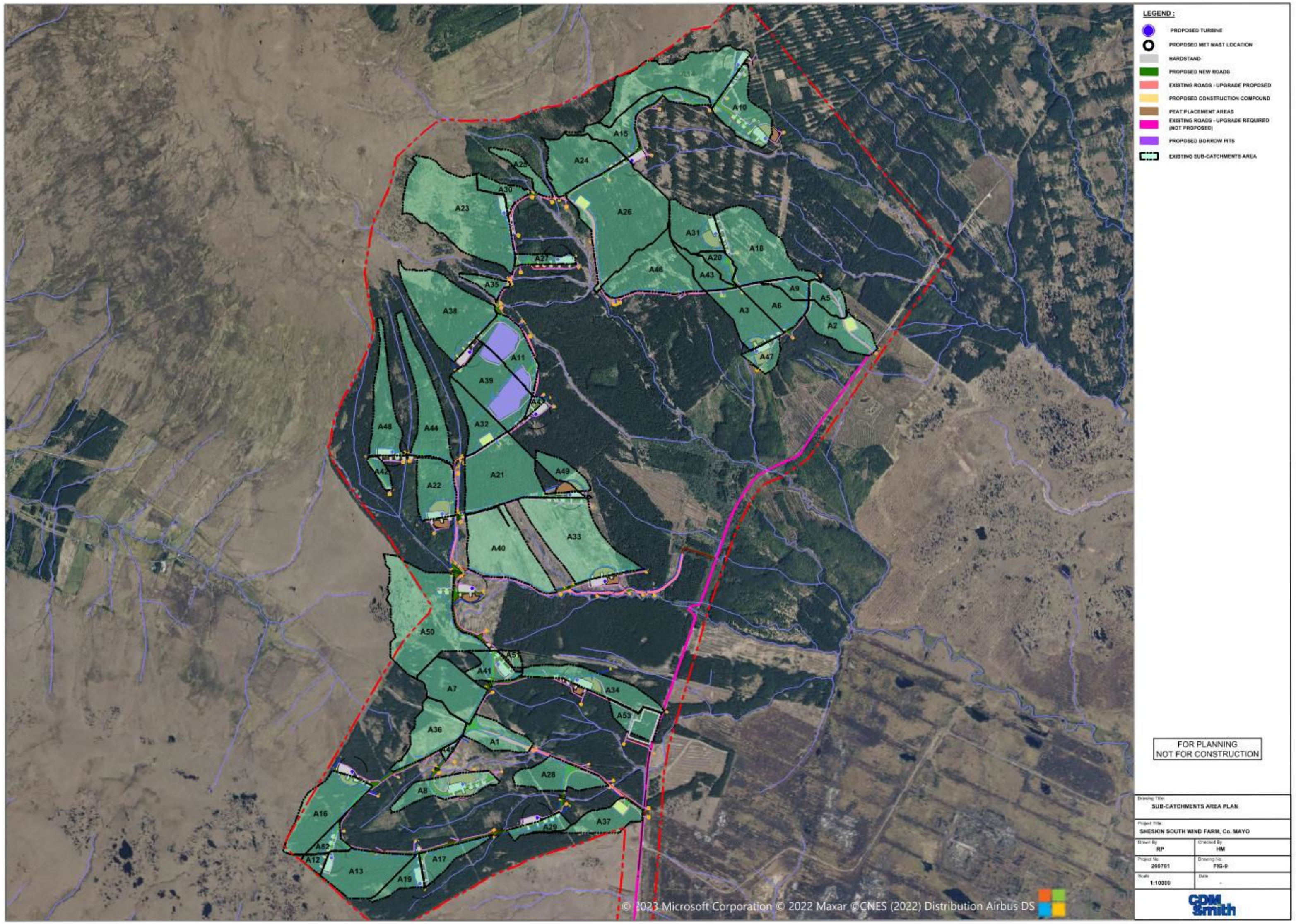


*Figure 9-17*
*Subcatchments Used To Calculate Greenfield Runoff*

Direct discharges to water courses will not take place. There are, however, locations constrained by physical space where some discharges will have to be within a few metres of water courses. In such instances, additional attenuation ponds and double silt fencing will be applied as additional measures, the details of which will be judged practically in the field. During construction, new drains will also be integrated with existing drains as much as possible to reduce the scale of earthworks and maintain current runoff patterns in Sheskin Forest.

Check dams will be incorporated along interceptor drains and swales to attenuate the flow and energy associated with storm events, thereby reducing scour and erosion and promoting the settling of sediments. Depending on slope, check dams will be incorporated every 50 m or less.

The proposed Construction and Environmental Management Plan (CEMP) in **Appendix 4-3** also incorporates measures related to drainage management. Runoff management is furthermore detailed in the Surface Water Management Plan in **Appendix 4-4**.

### 9.3.13 Proposed Monitoring

During the construction phase, a field monitoring campaign will be undertaken in local streams where construction activity takes place. This involves a) visual checks of drains, settlement ponds and streams, and b) daily measurements of field parameters temperature, pH, specific electrical conductivity (SEC), alkalinity and turbidity. The field measurements will be taken once a day, upstream and downstream of the construction activity. The field campaign will begin two weeks prior to activity starts and will cease up to four weeks after activity is completed, unless observations dictate that measurements should continue. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.

If visible impact occurs, works will be suspended at the discretion of the supervising engineer, in which case the problem will be identified and corrective action taken before recommencing works.

In addition, surface water samples will be taken to monitor for effects and any shifts in baseline conditions over the longer term and potential cumulative effects that may arise from other developments (Section 9.4.5). The following sampling is proposed:

- Samples will be collected from three tributaries of Sheskin River flow east out of Sheskin Forest before merging as the Sheskin River. This is necessary to be able to sample upgradient of infrastructure related to the Oweninny Phase 2 (OP2) wind farm (Section 9..4.5) and differentiate any effects between the two developments.
- Samples will be collected on Sheskin River near or at the EPA monitoring station referenced in Section 9.3.7. This is necessary to continue the baseline monitoring of the Sheskin River subcatchment as a whole and to be able to detect and describe the potential cumulative effects (if any) of OP2 operations on Sheskin River. OP2 extends the full length of Sheskin River east of Sheskin Forest.

The samples will be collected on a monthly schedule during construction and decommissioning, and on a quarterly schedule during the operational phase.

The monthly samples will be analysed for general physico-chemical parameters, nutrients, dissolved organic carbons, and true colour. The quarterly samples will be analysed for the same, but will also include dissolved metals and a suite of oil and fuel-related constituents.

The monthly sampling will be accompanied by field measurements of water temperature, pH, SEC, alkalinity and turbidity.

The broader purpose of the proposed monitoring is to quantity baseline conditions and track how this might evolve under changing climate and subcatchment conditions. The baseline monitoring will commence three months prior to commencement of the construction phase.

The data will be periodically (quarterly) reviewed to assess whether changes (trends) to water quality and cumulative effects are occurring.

# 9.4 Likely Significant Effects and Associated Mitigation Measures

## 9.4.1 'Do-Nothing Scenario'

If the Proposed Development were not to proceed, the commercial forestry operations will continue, involving coniferous plantation and tree-felling operations.

In this scenario, the existing surface water drainage will continue to function in the manner currently observed and experienced, which means that the WFD 'High' status objective will likely be maintained, which is a WFD environmental objective. Because there will be no changes to forestry operations or drainage, there will be no further or additional effects from current operations.

If there are new coniferous plantations, or re-ploughing to facilitate afforestation is planned, then reviews of the existing drainage systems will be required before activity commences in order to protect water courses from chemical and sediment loads, and from potential physical damage to water courses. The same applies before tree-felling operations commence, to assure that adequate protective measures are in place for the planned activity.

## 9.4.2 Construction Phase - Likely Significant Effects and Mitigation Measures

The likely significant effects of the Proposed Development and mitigation measures that were considered during the approximate 2-year construction phase (Chapter 2) relate to:

- Clearfelling of coniferous plantations
- Earthworks
- Culvert installations
- Cable works installations
- Hydraulic effects of drainage
- Water quality effects of drainage
- Pumping from open pits
- Accidental spills or leaks
- Release of cement-based products
- Wastewater management
- Turbine delivery route
- Public and private water supplies
- WFD water body status
- Designated sites

Mitigation measures consider specific actions which are designed to avoid, prevent or lessen potential effects – *i.e.,* mitigation by avoidance and mitigation by design.

### 9.4.2.1 Clear-Felling of Coniferous Plantation

A total of 117 ha of forest will be felled to accommodate the Proposed Development. The duration of the felling activity is less than six months. Tree felling is subject to a Felling Licence application to the Forest Service, in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI No. 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

Clear-felling involves the use of machinery. The activity results in physical disturbance of residual peat and subsoil. The disturbance is from vehicle tracking and skidding, forwarding extraction methods, and damage to existing tracks and timber/brush in stacking areas.

The related activity can release sediments, organic matter (including dissolved organic carbon) and nutrients into drains.

As described in Section 4.8.1, the activity is part of preparatory groundworks and will be conducted in stages over a planned duration of 10 months.

**Pathways:** Runoff, drains.

**Receptors:** Local streams and the Sheskin and Owenmore Rivers downstream.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be indirect, negative, moderate, temporary, reversible, and of high probability.

**Proposed Mitigation Measures:** Best practice methods will be incorporated into the forestry management. These are set out below and will be in accordance with:

- DAFM (2019): Standards for Felling and Reforestation.
- Coillte (2009): Forest Operations and Water Protection Guidelines.
- Coillte (2009): Methodology for Clear Felling Harvesting Operations; Forest Service (Draft).
- Forest Service of the Department of Agriculture, Food & the Marine (2008): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.

**Mitigation by Avoidance:** There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in **Table 9-13**.

*Table 9-13 Recommended buffer zone widths adjacent to aquatic zones*

| Average slope leading to the aquatic zone | | Buffer zone width on either side of the aquatic zone | Buffer zone width for highly erodible soils |
|---|---|---|---|
| Moderate | 0-15% | 10 m | 15 m |
| Steep | 15-30% | 15 m | 20 m |
| Very steep | >30% | 20 m | 25 m |

**Mitigation by Design:** Mitigation measures will be implemented wherever clear-felling is planned. The objective will be to mitigate the risk of mobilising suspended solids and nutrients into drains and surface water courses, as follows:

Small felling areas (<25ha), sequencing of felling to avoid intense felling in one subcatchment

- Limiting felling areas and sequencing the felling to avoid intense felling in one subcatchment.

- Machine combinations (*i.e.* handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance.
- Sediment/Silt traps will be strategically placed downslope within forestry drains near streams before ground preparation. The purpose is to slow water flow, increase residence time, and allow settling of silt. No direct discharge of such ditches to water courses will occur.
- Crossing of streams away from bridges and culverts will not be permitted. Checking and maintenance of roads and culverts will be on-going throughout felling activity. No tracking of vehicles through watercourses will occur. Existing interceptor drains will also not be disturbed.
- Clay, soil and silts will be removed from roads during wet periods and dust will be suppressed during dry spells.
- Main drains that accommodate the discharge from collector drains will include rock armour, as required, where there are steep gradients.
- On steep slopes and where felling inside the 50 metre buffer is required, it will be necessary to install double or triple sediment traps. All drainage channels will taper out before entering the buffer zone. This ensures that discharged water fans out over the buffer zone before entering the aquatic zone, with sediment filtered out by ground vegetation within the zone.
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in dedicated disposal areas.
- Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled.
- Brash management/removal.
- Brash mats will be used to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion, extraction will be suspended during periods of high rainfall.
- Timber will be stacked in dry areas and outside a 50 metre buffer. Straw bales and check dams will be emplaced on the downgradient side of timber storage/processing sites.
- Works will not be conducted during significant rainfall events (see Section 9.4.2.2) in order to minimise entrainment of exposed sediment in surface water run-off.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when tree-felling operations have been completed.

**Drain Inspection and Maintenance:** The following items will be conducted during pre-felling inspections and after:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines (*i.e.,* hot spot areas).
- Inspections of plant and machinery will be conducted prior to any works to assure all are in good condition.
- Inspection of drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. The pre-felling inspection will be conducted during rainfall events.
- Following tree felling, all main drains will be inspected to ensure that they are functioning.
- Extraction tracks nears drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; Culverts on drains exiting the site will be unblocked.
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

**Surface Water Quality Monitoring:** Surface water monitoring will be conducted as presented in Section 9.3.13. Field and sampling monitoring will be conducted upstream and downstream of the felling activity. Visual observation will be relied on to shut down activity if necessary, in order to fix or upgrade any components of mitigation which may be failing or underperform. Daily surface water monitoring forms will be used at every works site. These will kept on site for record and inspection.

**Residual Effects:** The proven forestry best practice measures proposed above will break the pathway between sources and receptors. Residual effects will be indirect, negative, slight, temporary, and of low probability.

**Significance of Effects:** With implementation of the proposed mitigation measures, likely significant effects on surface water receptors will not occur.

### 9.4.2.2 Earthworks

The construction phase involves earthworks in the form of excavation, movement, staging, and reinstatement of excavated materials. The scale of earthworks and the means and methods of conducting earthworks were presented in Chapter 4. Within the Proposed Development site, which encompasses 1,189 hectares (11.89 $km^2$), the proposed permanent development footprint is 24.22 hectares (0.24 $km^2$), or 2% of the total area.

The main risks associated with earthworks are direct releases/discharges of sediment load to surface water courses. Releases of sediments to surface water courses increases suspended sediment and organic matter loads. In a peat environment, such releases can affect water quality, water clarity, morphology, and aquatic habitats in the downstream direction. Clogging of streambed substrate is a morphological effect.

Compared to tree-felling, the scale of earthworks during the construction phase are considerably greater. This means that the potential magnitude of likely effects are also greater.

**Pathways:** Drainage, runoff, surface water discharge routes.

**Receptors:** Local streams and the Sheskin and Owenmore Rivers downstream.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be indirect, negative, significant, short-term, reversible, and of high probability.

**Mitigation by Avoidance:** Works areas will be kept at least 50 m from water courses to the extent possible. The proposed setback distance/buffer will serve to avoid:

- Direct physical damage to watercourses and associated releases of sediment.
- Direct entry of suspended sediments from earthworks into watercourses.
- Direct entry of suspended sediments from the drainage system into watercourses, which is achieved in part by ending drain discharges outside the buffer and allowing percolation across the vegetation within the buffer.

Risks and effects of earthworks are made greater during storm events. Hence, earthworks will not be conducted during significant storm events. The works programme for the entire construction stage of the development will take account of weather forecasts, notably predicted rainfall. Large excavations and movements of soil/subsoil or vegetation stripping will be scaled back or suspended if heavy rain is forecast. Threshold rainfall values will serve to guide decisions to suspend works, visually and/or judged from weather forecasting, by either of the following:

- High-intensity rainfall events, >10 mm/hr.
- Heavy frontal rainfall lasting most of the day, >25 mm in a 24-hour period.
- More than half the monthly average rainfall over 7 days.

The checking and communication of weather forecasts are part of the CEMP. Prior to suspending works for climatic reasons, the following control measures will be completed:

- Open excavations will be secured.
- Temporary or emergency drainage will be provided to prevent back-up of surface runoff in work areas.
- Working for up to 12 hours after heavy rainfall events will be avoided to ensure drainage systems are not overloaded. Decisions are subject to visual inspection and judgement by the resident (supervising) engineer. The intent and objective is to control erosion, avoid collapses of embankments, and limit the mobilisation and transport of sediments.

**Mitigation by Design:** Key mitigation by design measures that will be implemented comprise source controls, in-line controls and treatment systems, as follows:

- Source control measures cover working areas, staging areas and stockpiles. Methods that will be employed are diversion drains, flume pipes, sand bags, oyster bags filled with gravel, and filter fabrics. Flexibility to adapt methods will be required based on location-specific conditions, as judged by supervising engineers from visual inspection.
- In-Line controls involve settling of suspended sediments and particulate organic matter with the use of silt fences, straw bales, sand or oyster bags, weirs, baffles, and check dams. Flow limiters and sump pumping systems may be employed where needs arise in order to maintain the hydraulic functioning of the existing drain system.
- Treatment systems involve sediment traps and temporary sumps/attenuation ponds.

Moreover, clay, soil and silts will be removed from access roads during wet periods and dust will be suppressed during dry spells.

If discharge water fails to be of a high quality during regular inspection, then a filtration treatment system such as a "Siltbuster" or equivalent will be used to filter discharge water before release to water courses. This applies for the entire construction phase.

For discharges near water courses, within the 50 m buffer, and including discharges of greenfield runoff, double silt fences will be employed. These will be inspected and maintained, and remain in place throughout the entire construction phase.

Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats. Sediment entrapment mats, consisting of coir or jute matting, will be placed at the silt bag location to provide further treatment of the outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. Sedimats will extend the full width of the outfall to ensure all water passes through this additional treatment measure. Level spreaders will be designed for each outfall.

**Management of Runoff from Peat and Spoil Placement Areas:** Excavated peat and spoil will be used for landscaping, spread within the proposed peat placement areas around certain turbines and used to reinstate the 2 no. borrow pits. A Peat and Spoil Management Plan is presented in **Appendix 4-2**.

During the initial placement of peat and spoil, silt fences, straw bales and biodegradable matting will be used to control runoff from reinstatement areas. 'Siltbuster' treatment trains will be employed if previous treatment is not to a high quality, a stated above.

Drainage from peat placement areas will ultimately be routed to swales and settlement ponds with storage and settlement designed for a 6-hour duration, 1 in 10 year storm event. Peat and spoil placement areas will be vegetated to reduce sediment entrainment in runoff, which will further help to reduce risks of sediment mobilisation.

**Field Inspection:** An inspection and maintenance plan for the construction drainage system will be prepared in advance of commencement of works. Regular inspections of installed drainage systems will be undertaken, especially after heavy rainfall, to check for damage and blockages, and ensure there is no escape or build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.

Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. Checks will be conducted on a daily basis.

**Surface Water Quality Monitoring:** Monitoring will be performed as described in Section 9.3.13 and 9.4.2.1.

**Residual Effects:** Proven and effective measures to mitigate the risk of releases of sediment have been proposed which will break the pathway between potential sources and receptors. Hence, residual effects will be indirect, negative, not significant, short-term, and of low probability.

Moreover, residual effects will be monitored for and corrective action can be taken. Slight changes in current baseline conditions are expected during the construction phase but these are not sufficient to change the character or sensitivity of the receiving waters, and not sufficient to affect the 'High' status classification of the Sheskin water body (**Appendix 9-4**).

**Significance of Effects:** For the reason outlined above, likely significant effects on surface water quality will not occur.

### 9.4.2.3 Culverts at Stream Crossings

Culverting is necessary where new access roads will cross streams and where existing stream crossings need upgrades. Based on the planned layout (**Appendix A of Appendix 4-4**), there will be:

- 7 no. new culverted stream crossings
- 9. no. existing stream crossing upgrades

The works require use and movement of machinery and equipment which can result in physical disturbance of streambanks and streambeds, hence sediment mobilisation and both water quality and morphological effects.

**Pathway:** Runoff and streams

**Receptor:** Local streams and the Sheskin and Owenmore Rivers downstream.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be direct, negative, moderate, short-term, reversible, and of high probability.

**Mitigation Measures by Avoidance:** Machinery and personnel are kept out of the river directly. Direct in-stream works will be avoided.

**Mitigation Measures by Design:** All works will be conducted in accordance with the CEMP which incorporates the best practice IFI "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters" (IFI, 2016). Related activity incorporates many of the same measures that are presented in Section 9.4.2.2 (earthworks). Moreover:

- All stream crossings will be bottomless-box or clear span culverts. Existing banks will remain undisturbed.

- Based on IFI (2016), the relevant work period is July to September inclusive, *i.e.,* the relatively drier summer period. Any deviation that may be temporarily necessary will be done in discussion with the IFI.
- During near-stream construction works, double-row silt fences will be emplaced immediately downgradient of work areas for the duration of activity.
- All new stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

Underground cabling routes within the Proposed Development site (e.g. from turbines) will follow an existing access road or a road proposed for upgrade, and cables will pass within the structure of the road and associated culverts.

**Residual Effects:** With the proposed mitigation measures, residual effects will be direct, negative, not significant, short-term, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water courses will not occur.

### 9.4.2.4 Grid Connection Installation

As described in Chapter 4, the grid connection route passes south from Sheskin Forest along an existing roadway to the N59 National Primary Road, from where the route turns east and connects to grid at Bellacorick. Cables will be installed below ground in dug trenches except for two bridge crossings where trenchless technology by horizontal drilling will accommodate the crossing. Horizontal drilling involves the application of a drill rig. This is a heavy plant and requires secure and safe footing for operations, hence preparatory earthworks, including use of basecourse or mats. The risks of effects are the same as those described in Sections 9.4.2.2, 9.4.2.3, and 9.4.2.8.

With respect to the cable crossings, in-stream works will be avoided by directional drilling beneath water courses. Mitigation measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling will be implemented in full, as follows:

- The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages.
- One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks.
- Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility.
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

The duration of the activity is approximately 3 months.

**Pathways:** Runoff.

**Receptors:** Local streams and Sheskin and Owenmore Rivers downstream.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be direct, negative, slight, temporary, reversible and of medium probability.

**Mitigation by Design:** Applicable mitigation measures for dug trenches (which involves earthworks) are those described in Section 9.4.2.2 and 9.4.2.3. Where trenches are dug with excavators, spoil will be kept adjacent to the trenches and filled in immediately upon of installation of cables. Cable works will proceed in sections or segments to avoid trenches remaining open over protracted periods of time.

Where cables will cross streams in horizontally drilled boreholes, mitigation measures for earthworks and culverting also apply, per Sections 9.4.2.2 and 9.4.2.3.

**Residual Effects:** With mitigation measures, the residual effects are direct, negative, not significant, temporary, and unlikely.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water quality will not occur.

### 9.4.2.5 Hydraulic Effects of Drainage

The shallow interceptor drains that are planned upslope of infrastructure components, including access roads, are designed to capture greenfield runoff. While drainage patterns within Sheskin Forest will be modified, the water balance of the natural drainage system to Sheskin River is maintained.

The main risks associated with the construction of interceptor drains are a) sediment mobilisation to water courses, and b) the potential for draining peat. The latter involves hydraulic effects (see below) and can contribute to water quality effects (addressed in Section 9.4.2.6.

Draining of peat lowers water levels in the peat. This can result in subsidence/slumping of the peat surface in the hydraulically affected area(s) and a loss or changes to vegetation types/communities in the affected area(s).

The hydraulic effect of drainage propagates away from drains, in the upslope directions especially. There is no simple rule of thumb that can be applied to estimate how far the effect may extend. This is because bog science is location-specific. Bog hydrology is also dynamic and transient, responding to changes in event-based, seasonal, and longer-term climatic conditions. Researchers like Rezanezhad *et. al.* (2016), Holden (2009), and Ramchunder *et al.* (2009) also highlight the influence of drain depths, peat depths, relative slopes, the potential interference with other nearby drains, as well as peat stratigraphy, permeability, and structure.

In the UK and Irish scientific literature, there are empirically based examples of drainage effects, although these tend to be associated with deep and purposeful draining of peat for 'land improvement', turf-cutting or larger exploration purposes. Nevertheless, based on monitoring data from Derrycolumb, Co. Longford, Gill (2020) reported that "*water levels on the high bog adjacent to a 1.5m high facebank (with drain along production side) are not significantly influenced by the facebank and associated drainage beyond c. 40m distance*". Gill (2020) concluded that a "*zone of influence distance of 60 m would be a conservative buffer*". For deep perimeter bog drains at the same site, Gill (2020) reported that a "*conservative buffer*" of 100 m would apply.

Price *et al.* (2003) reviewed evidence on the "e*fficacy of drainage*" and referred to studies where water tables in peat were lowered to distances "*up to 50m from the ditch in fibrous peat*", but shorter distances in decomposed fen peat.

Based on monitoring at Clara Bog in Co. Offaly, Regan et al. (2019) estimated that the hydraulic effect of bog margin drainage extended up to 900 m into the bog, as evidenced by land subsidence. They cautioned that the sensitivity of a bog system to environmental change such as drainage will vary depending on the connectivity of the bog to the regional hydrological regime. A similar observation was made by Siegel and Glaser, (2006). In the case of Clara Bog, observations were based on a 28-year record of monitoring the bog is underlain by highly permeable glacial deposits.

The upland blanket bogs at and around the Proposed Development site are characterised by:

- Peat that is underlain by glacial till (silt/clay with sand and gravel) and poorly productive bedrock, which limits rainfall-recharge of the groundwater system and flow.
- Shallow depths to bedrock.

- High and frequent rainfall.

From this, it is considered that the peat is rainfall-dependent more so than groundwater-dependent, even though hydrogeology is part of the mechanism that limits recharge helps to maintain saturation of peat.

To advance the discussion pragmatically for the purposes of the EIAR, a distance of 100 m was used to guide the further discussion of potential effects, which would primarily occur during the operational phase (Section 9.4.3.2). This is because bog hydrology is dynamic and transient, and potential effects at distance will take time to be established - likely longer than the 2-year construction phase. For this reason, the discussion of hydraulic effects has greater relevance during the subsequent phases of the Proposed Development.

In contrast to potential effects of linear interception drains, the smaller excavations that will serve the construction of other infrastructure components (e.g. foundations of turbines) will involve temporary sump pumping, which is addressed in Section 9.4.2.7.

**Pathways:** Peat, drains.

**Receptors:** Peat.

**Pre-Mitigation Potential Effects:** Potential effects are indirect, negative, not significant, short-term, reversible and of medium probability.

**Mitigation Measures by Design:** Development footprints have been reduced to a minimum and interceptor drains will be shallow which serves to reduce the relative risk of drainage effects. The drainage system will be integrated with the existing drainage network in the forest to the maximum extent possible. All construction works will be supervised.

**Monitoring:** A network of up to 20 no. piezometers will be installed for monitoring of water levels in peat along the SAC boundaries, upslope of facilities that are closest to the SACs (e.g., turbines T2 and T17). The standpipes will be measured manually on a monthly interval and a select set of 6 no. standpipes along the SACs will be equipped with automatic data loggers for continuous water level measurement. The data will be periodically (quarterly) reviewed to assess whether effects are detected.

**Residual Effects:** Given the time span of construction (2 years), residual effects from the construction phase will be indirect, negative, not significant, short-term, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant hydrological or hydrogeological effects, beyond those already experienced in Sheskin Forest, are not expected to occur.

### 9.4.2.6 Water Quality Effects of Drainage

Drainage water can carry suspended matter, dissolved organic matter, and nutrients. If peat is excessively drained, drainage water can also affect the pH of surface water. Hence, local streams in the forest can experience shifts in baseline conditions even if this is unlikely to affect the larger Sheskin and Owenmore Rivers downstream.

Specific water quality issues relate to water clarity, colour, pH and nutrient concentrations. Sedimentation of suspended matter can affect streambed substrate, which is also a stream morphology issue. All items can affect aquatic habitat and biota.

Water quality deterioration has the potential to affect the WFD status classification of related surface water bodies, not in the construction phase but in the operational phase. This is described in Section 9.4.2.13 and in **Appendix 9-4**.

**Pathway:** Drains.

**Receptor:** Local streams and Sheskin and Owenmore Rivers.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be indirect, negative, slight, temporary, and of medium probability.

**Mitigation by Design:** Potential effects from construction works will be mitigated by drainage controls (e.g. Sections 9.4.2.1 through 9.4.2.3) which are established as part of drainage management. Further descriptions are presented in drainage-related **Appendices 4-1** and **4-4**, as well as Section 9.3.12.

**Monitoring:** Streams will be extensively monitored as described in Section 9.3.13.

**Residual Effects:** With the planned drainage system, residual effects will be indirect, negative, not significant, temporary, and of low probability.

**Significance of Effects:** For the reasons outlined above, changes to current baseline conditions may be measurable but likely significant effects will not occur.

### 9.4.2.7 Pumping from Open Pits

Open excavations for foundations and the Borrow Pit will have to be temporarily pumped to keep the excavations free of water. Excavation depths will range from <5 mbgl at turbine locations to approximately 11 mbgl at the two Borrow Pits. The depth of peat at the Borrow Pit sites is less than 1 m (**Appendix 4-2**).

Water will enter directly from rainfall and via subsurface seepage when the groundwater table is intersected. In bedrock, groundwater may ingress from fractures and a 'transition zone' that may be present at the contact between subsoils and bedrock. The quantities to be pumped will be small given the generally low-permeability characteristics of both the till and bedrock groundwater flow system.

The pumping from excavations will only be needed for short periods of time. For most components, the time frame is measured in days to weeks. However, the Borrow Pit excavation will be excavated and constructed over an approximately 10 month period, in four stages, as described in **Appendix 4-2**.

The pumped water, which contains suspended solids, will be pumped to the nearest swale and led to the associated settlement pond which has been established in the first stage of construction. The pond will serve to settle out sediments prior to discharge to the nearest water course.

The excavation-related water will be discharged periodically, on as-needed basis. It is not a continuous process, and quantities pumped will vary from location to location.

Given the geology of the Proposed Development site, the quantities that will be pumped and managed are expected to be less than 10 $m^3$/hr (0.0026 $m^3$/s, or 2.6 l/s). Pumping can be flexibly adapted (expanded) to accommodate higher pumping needs.

Discharges from sump pumping can affect the water quality of water courses, especially with regard to suspended sediments.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects will be indirect, negative, not significant, temporary, reversible, and medium probability. Hydrogeologically, from a quantitative perspective, pumping effects are direct, neutral, imperceptible, temporary and unlikely.

**Mitigation by Avoidance:** An upslope interceptor drain will be established upslope of the excavation area to prevent greenfield runoff into the excavations. Berms can also be used, as necessary.

**Mitigation by Design:** The water pumped by sump pumps will pass through silt bags before being discharged into the swale. As the water pass through the silt bags, the majority of sediment and organic matter is retained by geotextile fabric. The silt bags will be used with natural vegetation filters or sedimats. The sedimats will be secured to the ground surface using stakes/pegs. They will extend to the full width of the outfall to ensure that all water passes through this treatment measure. Level spreaders will be installed for each outfall.

The footprints of excavations for infrastructure foundation works and hardstanding have been planned to be as small as practicable. Excavations will be backfilled after completion of installations, which will serve to restore water levels and drainage patterns, hence reduce the temporary drainage effects.

**Residual Effects:** As outlined in the CEMP, the methods above are standard practice methods which serve to reduce suspended matter loads from discharges. In this manner, the sediment load is managed and residual effects will be indirect, negative, not significant, temporary, and of low probability. Hydrogeologically, from a quantitative perspective, residual pumping effects are direct, neutral, imperceptible, temporary and unlikely.

**Significance of Effects:** For the reasons outlined above, likely significant effects will not occur.

### 9.4.2.8 Accidental Spills, Leaks or Other Releases

Accidental spillage of fuels or chemicals represent a pollution risk to both groundwater and surface water, as well as aquatic habitats and biota.

**Pathways:** Runoff, drains, streams, groundwater.

**Receptors:** Groundwater, local streams and Sheskin and Owenmore Rivers downstream.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects are direct and indirect, negative, imperceptible to profound, brief to long-term, reversible and of low probability.

Small spills and leaks may cause effects that are imperceptible. Large or continuous spills and leaks can potentially damage the habitats and living organisms in the receiving water.

Hence, effects can be brief to long-term, depending on the nature and scale of the spills or leaks. Potential effects can be mitigated.

**Mitigation Measures by Design:** The prevention of, and responses to, accidental spills and leaks of fuel and other chemicals are covered by the CEMP and SWMP. The following mitigation measures will be implemented:

- Trained personnel will conduct onsite refuelling only.
- Onsite refuelling of machinery will be done by mobile double-skinned fuel bowsers.
- Drip trays and fuel absorbent mats will be available and used during all refuelling operations
- A permit for the fuel system will be put in place.
- Fuels stored onsite will be minimised. Fuel storage areas will be bunded to contain 110%v of the fuel storage volume for the time period of the construction. Rainwater will not be allowed to accumulate within the bund, and will thus be fitted with a storm drainage system and appropriate oil interceptor.
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.
- Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.

**Residual Effects:** With mitigation, residual effects will be indirect, negative, imperceptible, short-term, and unlikely.

Proven, routine, and effective measures to mitigate the risk of releases of fuels and chemicals are proposed which will break the link between potential sources and receptors.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water or groundwater quality will not occur.

### 9.4.2.9 Release of Cement-based Products

Entry of cement-based products into drains or surface water within the Proposed Development site represents a risk to the aquatic environment at and downstream of the release.

Concrete and other cement-based products are alkaline and can be corrosive. They generate fine, highly alkaline silt (pH 11.5) that can physically damage fish. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of $\pm$ 0.5 of a pH unit.

Batching of wet concrete onsite is not proposed. Washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Releases of cement-based products are obvious when they happen and can be stopped. They also involve small volumes (individually). Risks are increased with repeated poor practice.

**Pathways:** Drains, streams.

**Receptors:** Peat and streams.

**Pre-Mitigation Effects:** Pre-mitigation effects on peat are covered in Chapter 8. Pre-mitigation effects on surface waters can be direct and indirect (depending on how and where releases occur), and are negative, slight, temporary to short term, and of low probability.

**Mitigation Measures by Avoidance:**

- Concrete will be delivered in sealed concrete delivery trucks. Batching of wet-cement products will not occur on site.
- Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will take place.
- Pre-cast elements for culverts and concrete works will be used.
- Concrete trucks will not be washed out on site but will be directed back to their batching plant for washout.

**Mitigation Measures by Design:**

- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement-contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined washout ponds.
- Where temporary lined impermeable containment areas are used, such containment areas are built using straw bales and lined with an impermeable membrane. These are covered when not in use to prevent rainwater collecting.
- Pour sites of cement will be kept free of standing water, and plastic covers will be ready in case of sudden rainfall events.

Concrete deliveries are often conducted outside of normal working hours in order to limit traffic effects on roads. Concrete pouring for turbine foundations is normally complete in a single day per turbine.

Risks of pollution will be further reduced as follows:

- Concrete will not be transported around the site in open trailers or dumpers so as to avoid spillage while in transport.
- All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.
- Arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.
- Weather forecasting will be used to assist in planning large concrete pours and large pours will be avoided where prolonged periods of heavy rain is forecast..
- Concrete pumps and machine buckets from slewing over watercourses will be restricted while placing concrete.
- Excavations will be sufficiently dewatered before concreting begins and dewatering will continue while concrete sets.
- Covers will be available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Any potential, small surplus of concrete will be disposed of after completion of a pour in suitable locations away from any watercourse or sensitive habitats.

**Residual Effects:** Residual effects on peat are covered in Chapter 8. With mitigation, residual effects on surface water quality will be indirect, negative, imperceptible, short-term, and unlikely.

Proven, routine, and effective measures to mitigate the risk of releases of cement-based products are in place which will break the link between potential sources and receptors.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water or groundwater quality will not occur.

### 9.4.2.10 Wastewater Management

During the construction phase of the Proposed Development, staff welfare facilities will be provided at each of 4 no. construction compounds. Port-a-loos will be used. These will be collected regularly and brought offsite in fully enclosed tanks for disposal by authorised means (permitted wastewater collector) to a wastewater treatment plant.

**Pathways**: Runoff, drains.

**Receptors:** Local streams and Sheshkin River downstream, groundwater.

**Pre-mitigation Potential Effects:** Potential effects are direct and indirect, negative, not significant, short-term, reversible, and of low probability.

**Mitigation Measures by Avoidance:** Wastewater will not be treated or disposed of onsite.

**Residual Effects:** Use of sealed storage tanks and offsite disposal breaks the link between the source and potential receptors. With the planned management measures, residual effects will be indirect, neutral, imperceptible, short-term, and unlikely.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water or groundwater quality from wastewater will not occur.

### 9.4.2.11 Turbine Delivery Route Accommodation Works

As described in Chapter 4, accommodation works will be required covering an area of 1,500 $m^2$ at the junction of the N59 and L52926, and the intersection of the N17 and N5, comprising construction of widened junctions to facilitate the delivery of turbine components and other abnormal loads. Overnight, turbine blade storage area will also be required along the L52926 local road. The storage area will measure approximately 200 metres in length and will be 5 metres wide.

The activity involves earthworks, which was described in Section 9.4.2.2, and carries risk of accidental spills and leaks, which was described in Section 9.4.2.8.

**Pathway:** Runoff.

**Receptor:** Surface water (including Owenmore River).

**Pre-Mitigation Potential Effects**: Without mitigation, potential effects are direct, negative, moderate, temporary, and of medium probability.

**Mitigation Measures by Design**: Mitigation measures in relation to earthworks are presented in Section 9.4.2.2. Mitigation measures in relation to accidental spills, leaks or other releases are described in Section 9.4.2.8.

**Residual Effects:** With mitigation, residual effects are indirect, negative, not significant, temporary, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant effects on nearby surface waters will not occur.

### 9.4.2.12 Public or Private Water Supply

The site is not hydrologically linked to any sources of public water supply. Hence, the risk of affecting public water supplies are absent. The only risk is posed by private wells, at single dwellings and farms downgradient of the Proposed Development site. The nearest dwellings/farms are more 1.3km from the nearest proposed turbine location. Groundwater flow in the poorly productive bedrock aquifer is localized, with shorth flow paths (hundreds of metres) to local streams.

**Pathway:** Groundwater.

**Receptor:** Groundwater and private wells downgradient of site

**Pre-Mitigation Potential Effects:** Indirect, negative, imperceptible, permanent, unlikely (high probability).

**Proposed Mitigation Measures:** By following the best practice measures outlined for other potential effects (e.g. accidental spills and leaks, wastewater management) risks to private wells are eliminated.

**Residual Effects:** With mitigation, residual effects are indirect, neutral, imperceptible, permanent, and unlikely (high probability).

**Significance of Effects:** For the reasons outlined above, likely significant effects on public or private water supplies will not occur.

### 9.4.2.13 WFD Water Body Status

A WFD compliance assessment is presented in **Appendix 9-4**. The Proposed Development site is hydraulically connected with the Sheskin_010 and the Owenmore(Mayo)_040 river subbasins (Section 9.3.2). These both have 'High" status objectives assigned by EPA, and maintaining 'High' status is a priority for WFD implementation in Ireland (DHLGH, 2021).

Per the latest WFD status classification period (2016-2021), both water bodies met their WFD 'High' status objectives. As described in **Appendix 9-4** also, the underlying bedrock aquifers also met their WFD 'Good' status objective.

The Proposed Development has the potential to affect surface water quality, and effects can be translated further downstream. However, the duration of the construction phase is approximately 2 years. WFD status updates are determined and reported by EPA every 6 years. Accordingly, risks to WFD status are more relevant for the operational phase (Section 9.4.3.8).

**Pathways:** Runoff, drains, other discharges (e.g. spills and leaks).

**Receptors:** Local streams and Sheskin and Owenmore Rivers downstream, groundwater.

**Pre-Mitigation Potential Effects:** Without mitigation, potential effects on WFD status of the named river subbasins are indirect, negative, imperceptible, short-term, and unlikely (high probability). The same applies for the underlying groundwater bodies.

**Mitigation by Design:** Mitigation measures are necessary and proposed to break potential source-receptor linkages and allow for attenuation. The means and methods of achieving the necessary levels of protection are proven and established based on existing guidance and practical experiences from other comparable sites.

Relevant mitigation measures are all of those described in the preceding sections for the construction phase. The Contractor will be legally required to adhere to the CEMP. Extensive monitoring will be undertaken to monitor water quality (Section 9.3.13) in order to identify potential effects and take corrective action, as necessary.

**Residual Effects:** With mitigation, residual effects are indirect, negative, imperceptible, short-term, and unlikely (high probability). The same applies for the underlying groundwater bodies.

**Significance of Effects:** For the reasons outlined above, likely significant effects on WFD status of the named river subbasins will not occur in the construction period. The same applies for the underlying groundwater bodies.

### 9.4.2.14 Designated Sites

An assessment on potential effects on designated sites is included with **Appendix 9-4**. As presented in Chapter 6, there are three SACs that directly border the Proposed Development site:

- Slieve Fyagh Bog Complex SAC
- Carrowmore Lake Complex SAC
- Glenamoy Bog Complex SAC

The Slieve Fyagh Bog Complex SAC is hydrologically and hydrogeologically upgradient of the Proposed Development site. Drainage from the SAC enters Sheskin Forest near turbine T3.

The Glenamoy Bog Complex SAC is located across a topographic divide and is hydrologically and hydrogeologically separated from the Proposed Development site.

The positions of the Slieve Fyagh Bog Complex SAC and Glenamoy Bog Complex upgradient and in a separate subcatchment from the Proposed Development, respectively, means that they cannot be hydrologically or hydrogeologically affected during construction.

The Carrowmore Lake Complex SAC borders the Proposed Development site around the southern part of Sheskin Forest. Water drains west, south and southeast from the SAC (**Figure 9-2**). The water courses that drain west and south are in different subcatchments from the Proposed Development. The water that drains to the southeast forms headwater streams that cross the grid connection route which is downgradient of the SAC. While there is a potential to affect the water quality of these streams during construction of the grid connection route, the streams cannot be affected upstream within the SAC boundary.

In theory, construction dust could blow onto each SAC, but mitigation measures will be put in place for dust suppression purposes. The nearest distance from an SAC boundary to planned infrastructure are:

- Slieve Fyagh Bog SAC – 230m (access track to turbine T5 and met mast, southeast of SAC).
- The Carrowmore Lake Complex SAC – 25m (hardstanding for turbine T2, east of SAC).
- The Glenamoy Bog Complex SAC – 195m (access track to turbine T12, southeast of SAC).

There are two SACs/SPAs that are indirectly linked to the Proposed Development site via the Owenmore River, *i.e.,* in the downstream direction:

- Bellacorick Bog Complex SAC
- Owenduff/Nephin SAC/SPA

As explained in **Appendix 9-4,** potential effects on either are considered highly unlikely as both of the SACs/SPA are on the opposite sides of the Owenmore River from the Proposed Development site, and as such their water dependencies are related to hydrological and hydrogeological conditions which are isolated from the Proposed Development site.

**Pathway:** Local streams and Sheskin and Owenmore Rivers downstream.

**Receptor:** Water-dependent habitats of SACs/SPAs bordering the Proposed Development site and along floodplains of the Owenmore River downstream.

**Pre-Mitigation Potential Effects:** Based on proximity to the grid connection route, potential effects to Carrowmore Lake SAC are indirect, negative, not significant, short-term, and low probability.

**Mitigation Measures by Design:** Mitigation measures described in Sections 9.4.2 generally will serve to mitigate potential effects on named SACs/SPA. Mitigation measures in Sections 9.4.2.1 through 9.4.2.4, and 9.4.2.8, specifically will serve to protect the Carrowmore Lake Complex SAC.

**Residual Effects:** With mitigation measures, residual effects will be indirect, negative, imperceptible, short-term, and unlikely.

**Significance of Effects:** For the reasons outlined above, likely significant effects on the designated sites will not occur.

### 9.4.3 Operational Phase - Likely Significant Effects and Mitigation Measures

The likely significant effects of the Proposed Development and mitigation measures that were considered during the 35-year operational phase (Chapter 4) relate to:

- Maintenance works.

- Hydraulic effects of drainage.
- Water quality effects of drainage – general.
- Water quality effects of drainage – designated sites.
- Compaction of access roads and hardstanding.
- Water well installation and pumping.
- Wastewater management.
- WFD water body status.

Mitigation measures consider specific actions which are designed to avoid, prevent or lessen potential effects – *i.e.,* mitigation by avoidance and mitigation by design.

### 9.4.3.1 Maintenance Works

During the operational phase, maintenance works of access roads, structures, and drainage system components (e.g. settlement ponds) will be undertaken regularly per the SMWP. Maintenance is a repeated activity which includes cleaning and removal of accumulated sediments, in addition checks and replacements necessary for the electro-mechanical installations.

For the drainage system, potential will be related to sedimentation and damage to water courses. However, risks are much reduced compared to the construction activity as the scale works are less.

Accidental spills and leaks can also occur. Oil used in transformers at the substation and within each turbine, and storage of oils in tanks at the substation, could leak during the operational phase and impact on streams and groundwater. Risk can be managed by following the mitigation measures presented in Section 9.4.2.8. The substation transformer and oil storage tanks will be in a concrete bund capable of holding 110% of the stored oil volume. Turbine transformers are located within the turbines, so any leaks would be contained within the turbine structure.

**Pathway:** Runoff and drains, surface water, and groundwater (for accidental spills and leaks).

**Receptor:** Local streams and Sheskin and Owenmore Rivers, and groundwater (for accidental spills and leaks).

**Pre-Mitigation Potential Effects:** Potential effects will be those that would occur without the SWMP, in which case the potential effects will be indirect, negative, slight, long-term, and of medium probability.

**Mitigation by Design:** Maintenance works will be subject to control measures contained in Section 3.2.3 of the SWMP (**Appendix 4-4**).

**Monitoring:** Monitoring will be performed as described in Section 9.3.13.

**Residual Effects:** With mitigation measures, residual effects will be indirect, negative, not significant, long-term, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant effects from maintenance works will not occur.

### 9.4.3.2 Hydraulic Effects on Designated Sites

The assessment in Section 9.4.2.3 is particularly relevant to the SACs that border the Proposed Development site in the upslope directions, namely:

- Slieve Fyagh Bog SAC
- Carrowmore Lake Complex SAC
- Glenamoy Bog Complex SAC

Each SAC has active blanket bog among their qualifying interests, and being upslope of planned drainage, there is a potential they could become affected if the peat within the Proposed Development site is excessively drained. For this reason, the topic received closer consideration. As stated in Section 9.4.2.5, the effects would be longer-term and are more relevant to the operational phase (and beyond).

The Slieve Fyagh SAC is partially within the same surface water catchment as Sheskin River. The other two SACs are in different subcatchments, across topographic divides. Nonetheless, the blanket bog is contiguous across the divide.

The nearest distance from respective SAC boundaries to planned drainage features (considering relative directions of drainage) are:

- Slieve Fyagh Bog SAC – 230 m (access track to turbine T5 and met mast).
- Carrowmore Lake Complex SAC – 25m (hardstanding for turbine T2).
- Glenamoy Bog Complex SAC – 195m (access track to turbine T12).

The areas where planned infrastructure is within or approaches the 100 m distance criterion proposed in Section 9.4.2.3, in the upslope direction, are:

- Turbines T2 and T17 in the southwestern portion of the site (Carrowmore Lake SAC)
- Turbines T3 and T5/met mast (Slieve Fyagh Bog SAC)
- Turbine T12 (Glenamoy Bog Complex SAC).

Given the layout of the Proposed Development (Chapter 4), it is principally the interceptor drains between turbines T2 and T17, between T3/T4 and T5/met mast, and between T13 and T12, that would pose a hydraulic risk to the named SACs.

Taking the drain that will run along and upslope of the access track between turbines T2 and T17 as an example (see **Figure 8-1**), this covers a distance of approximately 500 metres. The section runs sub-parallel to the Carrowmore Lake SAC boundary and is roughly perpendicular to the expected slope and expected hydraulic gradient to the southeast. Both T2 and T17 are close to the SAC boundary, and assuming a hydraulic effect of drainage translates 100 m into the SAC, the area within the SAC that would be hydraulically influenced (further assuming the effect translates in the bog across the topographic divide) becomes:

$$100 \text{ m} \times 500 \text{ m (length)} = 50{,}000 \text{ m}^2, \text{ or } 5 \text{ ha.}$$

This equates to 0.14 % of the total SAC area (3,648 ha; NPWS, 2017).

Although effects along SAC boundaries can theoretically add up, the probability of significant hydraulic effects extending into the SACs is low. This is because the blanket bogs are significantly 'wet' (high and frequent rainfall in the upland setting), the planned drains are shallow, and the weight of evidence from literature indicates that hydraulic effects will not be significant.

**Pathways:** Peat and shallow groundwater

**Receptors:** Peat

**Pre-Mitigation Potential Effects:** Indirect, negative, not significant, long-term, and of low probability.

**Mitigation Measures by Design:** Development footprints have been reduced to a minimum which mains drainage is also reduced to the extent possible. Maintaining shallow drains as proposed reduces the scope and likelihood of drainage effects. The drainage system will be integrated with the existing network in the forest.

**Monitoring:** The monitoring of the proposed piezometers in Section 9.4.2.5 will continue through the operational and decommissioning phases

**Residual Effects:** Indirect, negative, imperceptible, long-term, and of low probability.

Any effects that may be detected in the piezometers will have to be assessed, specifically whether they could be caused by other factors. Any residual effects from the operational phase would involve small areas as indicated above, and are reversible through hydraulic measures should they occur.

**Significance of Effects:** For the reasons outlined above, likely significant hydrological or hydrogeological effects on the SACs will not occur.

### 9.4.3.3 Water Quality Effects - General

Water quality risks during the operational phase are much reduced compared to the construction phase. Maintenance activity is the main item that can affect water quality, at times when the drainage system undergoes periodic cleaning and/or replacement of installations. The interceptor drains capture greenfield runoff which may contain suspended and dissolved organic matter, which attenuates in the downstream direction.

Specific water quality issues relate to sedimentation, water clarity, pH and nutrient concentrations. Sedimentation is a stream morphology issue. All items can affect aquatic habitat and biota.

Extensive monitoring is proposed for the operational phase, to identify and track water quality (Section 9.3.13).

**Pathway:** Runoff, drains

**Receptor:** Local streams and Sheskin and Owenmore Rivers downstream

**Pre-Mitigation Potential Effects:** Without mitigation (e.g., maintenance), potential effects will be indirect, negative, slight, long-term, and of low probability.

**Mitigation Measures by Design:** During the operational phase, potential effects will be mitigated by implementation of the SWMP and maintenance works (Section 9.4.3.1).

**Monitoring:** Streams will be monitored as described in Section 9.3.13.

**Residual Effects:** With mitigation, residual effects are expected to be indirect, negative, not significant, long-term, and of low probability.

It is possible that current baseline conditions will evolve during the 35-year operational phase, and it will be important to monitor water quality regularly to be able to assess whether these derive from the Proposed Development or other climatic or cumulative effects (Section 9.4.5).

**Significance of Effects:** For the reasons outlines above, and with the extensive mitigation and monitoring measures that are proposed, likely significant effects on the surface water receptor environment are not expected to occur.

### 9.4.3.4 Water Quality Effects – Designated Sites

Without mitigation measures, activities in Sheskin Forest can affect the water quality and morphology of local streams and Sheskin River. Effects can also reach the Owenmore River downstream.

Near its confluence with Sheskin River and north of Bellacorick, the Owenmore River borders the Bellacorick Bog Complex SAC. Hence, the Proposed Development is hydrologically, albeit indirectly, linked to the Bellacorick Bog Complex SAC. A potential effect of the Proposed Development on the SAC is, however, considered highly unlikely. This is because the SAC is on the eastern flood plain of Owenmore River and the SAC is dependent on surface water and groundwater inflows from the north and east.

The Owenmore River also borders the Bellacorick Bog Complex SAC at Bellacorick, this time on the south side of the river. This part of the SAC receives inflows from the south, and the SAC at this location is considered to be outside of any possible influence of Sheskin River.

By extension, the Owenmore River borders the Owenduff/Nephin Complex SAC/SPA further downstream, several kms west of Bellacorick. The SAC/SPA also drains from the south, and for the same reason, the SAC/SPA is considered to be outside of any possible influence of Sheskin River.

With regard to the grid connection route, this follows an existing roadway south from Sheshkin Forest which passes east of the Carrowmore Lake Complex SAC. Several small tributaries drain south from the SAC to the Owenmore River (approximately 4 km downstream from Bellacorick). The tributaries are part of the Owenmore (Mayo)_040 water body.

The construction of the grid connection route involves earthworks (trenching, ducting and filling) and stream crossings using existing bridges and trenchless technology (horizontal drilling). The SAC is hydrologically upstream of the route, and for this reason, there will be no deterioration of water quality or WFD status of water bodies within the SAC.

The Slieve Fyagh Bog SAC and Glenamoy Bog Complex SAC referred to in Section 5.1 are upslope and/or in separate subcatchments from the Proposed Development. For this reason, there will be no deterioration of water quality within respective SACs.

**Pathway:** Local streams and Sheskin and Owenmore Rivers downstream.

**Receptor:** Water-dependent habitats of SACs/SPAs bordering the Proposed Development site and along floodplains of the Owenmore River downstream.

**Pre-Mitigation Potential Effects:** Based on proximity to the grid connection route, potential effects to Carrowmore Lake SAC are indirect, negative, not significant, short-term, and low probability. For the other SACs/SPA, potential effects are Indirect, negative, imperceptible, long-term, unlikely (high probability).

**Mitigation Measures by Design:** Mitigation measures described in Sections 9.4.4 generally will serve to mitigate potential effects on SACs/SPA, although water quality effects are not likely given their geographic positions relative to the Proposed Development site.

**Residual Effects:** With mitigation measures, residual effects will be indirect, negative, imperceptible, long-term, and unlikely (high probability).

**Significance of Effects:** For the reasons outlined above, likely significant effects on the designated sites will not occur.

### 9.4.3.5 Compaction of Access Track and Hardstanding

Access roads and hardstanding (e.g., turbine spaces) will reduce the permeability of the ground across respective areas. Over time, these may become compacted further, which in theory can increase runoff from such areas.

The total footprint of access roads and hardstanding for turbines is 237,761 $m^2$. In **Appendix 9-3**, the runoff from these areas was calculated to be 0.321 $m^3/s$ for a 1 in 10 year storm event, using a runoff coefficient of 0.7. Accounting for compaction in the future (which reduces ground permeability), by adjusting the runoff coefficient to 0.8, runoff volumes will increase by 0.0045 $m^3/s$ to 0.366 $m^3/s$. To settle out particles of 10 µm (**Appendix 9-3**), this increases the associated settlement pond area requirements by 193 $m^2$ in total, which does not pose a practical challenge across the Proposed Development site.

**Pathways:** Drainage.

**Receptors:** Local streams and Sheskin River downstream

**Pre-Mitigation Potential Effects:** Without maintenance, potential effects will be indirect, negative, slight, long-term, and of medium probability.

**Proposed Mitigation by Design:** The operational phase drainage system (**Appendix 4-4**) will be functioning and maintained (Section 9.4.3.1).

**Residual Effects:** With maintenance, residual effects will be indirect, negative, imperceptible, long-term, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant effects from surface compaction will not occur.

### 9.4.3.6 Water Well Installation and Pumping

As described in Chapter 4, staff welfare facilities will be provided at control buildings during the operational phase. There will be a small water requirement for welfare facilities, but not for potable use. It is proposed to harvest rainwater from roofs or, alternatively, install a well adjacent to the electrical substation in accordance with the Institute of Geologists Ireland (IGI) "*Guide for Drilling Wells for Private Water Supplies*" (IGI, 2007).

The well would be flush to the ground and covered with a standard manhole. A pump house is not required as an in-well pump will direct water to a water tank within the roof space of the control building. Bottled water will be supplied for drinking, if required.

The volumes of groundwater that would be pumped are small, <5 $m^3/d$. The pumping would be intermittent. The hydraulic influence of pumping would be localised and would not result in any significant reduction in groundwater levels, peat water levels, or natural groundwater baseflow to streams.

**Pathways:** Groundwater.

**Receptors:** Groundwater, peat, and local streams.

**Pre-Mitigation Potential Effects:** Direct, negative, imperceptible, long-term, and of low probability.

**Mitigation Measures:** Rainwater harvesting to reduce the need for groundwater pumping further.

**Residual Effects:** Direct, neutral, imperceptible, long-term, and of low probability.

**Significance of Effects:** For the reasons outlined above, likely significant effects will not occur from low-volume well pumping.

### 9.4.3.7 Wastewater Management

Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. It is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control building will be managed by means of a sealed storage tank, with all wastewater being transported offsite by permitted waste collector to wastewater treatment plants.

**Pathways**: Runoff, drains.

**Receptors:** Local streams and Sheshkin River downstream, groundwater.

**Pre-mitigation Potential Effects:** Indirect, negative, imperceptible, long-term, reversible, and unlikely.

**Mitigation Measures by Avoidance:** Wastewater will not be treated or disposed of onsite.

**Mitigation Measures by Design:** The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system will be submitted to the Planning Authority in advance of any works commencing on-site. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site.

**Residual Effects:** Use of sealed storage tanks and offsite disposal breaks the link between the source and potential receptors. Hence, residual effects will be indirect, neutral, imperceptible, long-term, and unlikely.

**Significance of Effects:** For the reasons outlined above, likely significant effects on surface water or groundwater quality from wastewater management will not occur.

**Significance of Effects:** For the reasons outlined above, no significant effects on receptors water bodies will occur.

### 9.4.3.8 WFD Water Body Status

During the operational phase, risks of water quality effects are much reduced compared to the construction. Maintenance activity is the main item that can affect water quality.

In the operational phase, the functional drainage management system and all necessary mitigation measures are in place to limit the entry of potential pollutants, especially sediment and suspended and dissolved organic matter, to local streams.

In the context of WFD status, all of the water quality parameters which can affect the biological quality elements of rivers are addressed by the mitigation measures. Parameters like pH and ammonia, which can be influenced by drainage from peat, will undergo attenuation in the downstream direction by a) mixing/dilution with the greenfield runoff, b) further mixing/dilution in the streams, and c) in-stream transformation mechanisms (e.g. nitrification) that will take place in the downstream direction.

It is worth noting that 'High' and 'Good' status have been maintained in site-related surface and groundwater bodies, respectively, over three successive river basin management cycles. This means that existing forestry operations and land uses in and around Sheskin Forest have not affected WFD status objectives.

Nevertheless, a comprehensive monitoring programme is necessary and proposed to be able to identify and track any potential effects that may arise, especially in context of climate change and possible other future developments (Section 9.4.5).

**Pathway:** Runoff, drains

**Receptor:** Local streams and Sheskin and Owenmore Rivers downstream

**Pre-Mitigation Potential Effects:** Without mitigation potential effects are indirect, negative, slight, long-term, and of low probability.

**Mitigation Measures by Design:** During the operational phase, potential effects will be mitigated by implementation of the SWMP and maintenance works (Section 9.4.3.1).

**Monitoring:** Streams will be monitored as described in Section 9.3.13.

**Residual Effects:** Based on the Proposed Development alone, mitigation measures are in place to address identified risks, and residual effects will be indirect, negative, not significant, long-term, and of low probability.

**Significance of Effects:** For the reasons outlines above, and with the extensive mitigation and monitoring measures that are proposed, no likely significant effects on WFD status of surface water and groundwater bodies are expected to occur during the operational phase.

## 9.4.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential effects associated with decommissioning of the proposed development will be similar to those associated with construction but of a reduced magnitude.

Decommissioning works are described in Chapter 4. During decommissioning, it will be possible to reverse or at least reduce some of the potential effects caused during construction, and to a lesser extent operations, by rehabilitating constructed areas such as turbine bases and hardstanding. This will be done by re-establishing vegetation, thereby reducing runoff and sediment loads.

Roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be used by ongoing forestry works and for recreational purposes.

The electrical cabling connecting the Proposed Development site infrastructure to the substations will be removed, while ducting will remain in-situ rather than excavating and removing it, as this is considered to have less of a potential environmental effect, in terms of soil disturbance, and thus on the possibility of the generation of suspended sediment.

The turbines will be removed by disassembling them in a reverse order to their erection. This will be completed using the same model cranes as used in their construction. They will then be transported offsite along their original delivery route. The disassembly and removal of the turbines will not have an effect on the hydrological/hydrogeological environment at the Proposed Development site.

Other effects such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude than the construction phase because of the smaller scale of the works and reduced volumes on-site. As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is, therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm."*

Some of the effects will be avoided by leaving elements of the proposed development in place where appropriate. Turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects.

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. With these measures, no significant effects on the hydrological and hydrogeological environment will occur during the decommissioning stage of the Proposed Development.

## 9.4.5 Cumulative Effects

Developments within 20 km of the site boundary that were considered for cumulative effects are presented in Figure 2-3 and Figure 13-16. They are:

- ABO Sheskin (8 no. turbines) – consented
- Bellacorick (21 no. turbines) – operational
- Oweninny Phase 1 (29 no. turbines) - operational
- Oweninny Phase 2 (32 no. turbines) – under construction
- Oweninny Phase 3 (18 no. turbines) – pre-planning
- Bunnahowen (3 no. turbines) – operational
- Glenora (22 no. turbines) – pre-planning

In addition, there are plans for a hydrogen plant just northeast of the Bellacorick substation[5], and in proximity with the terminus of the grid connection route for the Proposed Development.

Of these, and from the hydrological and hydrogeological perspectives, only ABO Sheskin and Oweninny Phase 2 are relevant to the cumulative effects assessment. Both are located within the subcatchment of the Sheskin_010 water body. Specifically:

- ABO Sheskin is situated immediately north of the Proposed Development site. The ABO Sheskin site is drained by the "unnamed stream" referred to in Section 9.3.2.
- Oweninny Phase 2 (OP2) borders Sheskin River in the 'Oweninny cutaway bog' site on lower ground to the east of the Proposed Development, extending south to the N59 National Primary Road.

The Oweninny Phase 1, Oweninny Phase 3, and Bellacorick wind farm developments are only relevant in so far that they can influence the Oweninny and Owenmore Rivers, but not Sheskin River since they are located in separate subcatchments from Sheskin River.

ABO Sheskin and APO2 can influence the Sheskin River, in different ways. ABO Sheskin is situated in an upland setting and carries the same risks and potential effects that are described in the current Chapter 9. OP2 is operational. It resides within a bog which was exploited by Bord Na Móna (BNM) and has been subject of a bog rehabilitation programme between 2001 and 2012 (BES, 2013; ESBI, 2015).

Accordingly, Sheskin River will be under conflicting influences of added pressures from ABO Sheskin and bog restoration activity in the APO2 operational area.

Based on these observations, there is potential for cumulative effects on Sheskin River in combination with ABO Sheskin (mainly) and OP2. There are no potential cumulative effects on the groundwater environment.

Cumulative effects are defined by measurable water quality deterioration of the Sheskin and Owenmore Rivers in the longer term, mainly from sediment transport and sedimentation, but potentially also from nutrients, dissolved organic matter, water clarity, and pH.

[5] https://www.eplanning.ie/MayoCC/AppFileRefDetails/22502/0

With the specified mitigation measures for the Proposed Development and with similar measures implemented for ABO Sheskin, the likely cumulative effects on the Sheskin and Owenmore Rivers will, however, not be significant.

To be able to detect and distinguish potential effects of the Proposed Development on Sheskin River from both ABO Sheskin and OP2, additional monitoring stations are necessary as follows:

- One monitoring station on the "unnamed stream" before it merges with Sheskin River. This will serve to monitor effects from ABO Sheskin.
- Three monitoring stations on three tributaries Sheskin River that flow out from Sheskin Forest. This is necessary to be able to sample upgradient of OP2 infrastructure and differentiate the effects of the Proposed Development from OP2.
- To continue the monitoring near the EPA monitoring station referenced in Section 9.3.7 to be able to monitor the cumulative effect of OP2 (if any) on Sheskin River.

This is acknowledged in Section 9.3.13. To understand any effects that may arise from the totality of developments within the Owenmore River catchments, more detailed spatial sampling is necessary along the Oweninny and Owenmore Rivers. However, in context of the Proposed Development, the itemised items above are sufficient to parse the contribution from the Sheskin River subcatchment.

With regard to the hydrogen plant referred to above, this is situated adjacent to the Owenmore River downstream of the confluence point with Sheskin River. Construction and operations at the plant can affect the water quality of Owenmore River below the plant location, and as such it does not interact hydrologically or hydrogeologically with the Proposed Development. The end points of the grid connection routes from both developments will be roughly at the same location near the former Bellacorick power station, but associate construction works do not cause any significant hydrological or hydrogeological cumulative effects.

# APPENDIX 9-1

## FLOOD RISK ASSESSMENT REPORT

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# Appendix 9-1 Flood Risk Assessment

## 1. Introduction

CDM Smith Ireland Ltd (CDM Smith) was requested by MKO, on behalf of Sheskin South Renewables Power Designated Activity Company (DAC), to complete a Preliminary Flood Risk Assessment (FRA) for the planning application for a proposed wind farm development (Proposed Development) at Sheskin, Co. Mayo.

The Proposed Development site covers an area of 1,189 hectares (ha), of which 24.22 ha represents the proposed permanent development footprint, *i.e.,* 2% of the total site area. The development comprises 21 no. turbines and associated works which are set out in Chapter 4 of the Environmental Impact Assessment Report (EIAR).

Topography slopes from west to east, from approximately 230 mOD at the western boundary to 100 mOD at the easter boundary. The catchment area of the Proposed Development is characterised in Chapter 9 (Hydrology and Hydrogeology) of the EIAR.

### 1.1 Purpose of Assessment

The purpose of this FRA is to determine and communicate whether the Proposed Development may cause a flood risk within or downgradient of the Proposed Development area. The FRA supplements Chapter 9 of the EIAR.

Flood risk can generally be expressed as:

Probability of Flooding x Consequences of Flooding

Accordingly, the FRA has considered both the catchment characteristics and the proposed drainage design in Appendix 4-4 (Drainage Design Drawings) and Appendix 9-3 (Drainage Design Calculations).

### 1.2 Statement of Authority

Established in Ireland since 2001, CDM Smith's ISO 9001, ISO 14001 and OHSAS 18001 - accredited Dublin office works on a diverse range of water and environmental projects for public and private sector clients, including the preparation of flood risk assessments associated with new developments.

This flood risk assessment (FRA) was prepared by Henning Moe (registered P. Geo.), a hydrogeologist with over 30 years of practical experience, and Jon Hunt (registered P. Geo.), a geologist with over 20 years of practical experience.

### 1.3 Methodology

This FRA was conducted in accordance with "The Planning System and Flood Risk Management Guidelines for Planning Authorities" (DEHLG/OPW, 2009). Per the guidance, Stage 1 of the FRA involves:

- Flood risk identification, to determine whether surface water flooding issues may be present at a site; and
- Initial flood risk assessment, to confirm sources of flooding that may affect a new development.

A Stage 2 FRA involves the confirmation of sources of flooding, appraising the adequacy of the available information and determining what surveys or other approaches (e.g., modelling) may be required for further assessment if a specific flood risk is identified.

The FRA presented in this appendix is a Stage 2 FRA. It has involved researching and collating flood-related information from the following public data and information sources:

- Office of Public Works (OPW) Flood Hazard Maps and flooding information for Ireland, available at www.floodmaps.ie.
- Catchment Flood Risk Assessment Management (CFRAM)/OPW Flood Risk Assessment Maps.
- Historical base maps from Ordnance Survey of Ireland (OSI).
- Geological Survey of Ireland (GSI) online map viewer.
- Environmental Protection Agency online map viewer.
- Site walkover and drainage observations.

OPW also published the Flood Risk Management Climate Change Sectoral Adaptation Plan in 2019 under the National Adaptation Framework and Climate Action Plan. The former outlines OPW's approach to climate change adaptation in terms of flood risk management. To account for projected climate change effects which are likely to worsen flooding and flood risk, OPW's plan presents two future flood risk scenarios to consider when assessing flood risk: a) a 'Mid-Range Future Scenario' (MRFS), and a 'High-End Future Scenario' (HEFS). For the purpose of this FRA, the Proposed Development was assessed in relation to the MRFS as a likely future scenario.

# 2. Flood Risk Identification

## 2.1 OPW Flood Incident Maps

The OPW's Past Flood Events mapping does not show any recurring flood incidents within the Proposed Development site or immediately downstream (**Figure 1**). The nearest historical flood incident was recorded on the Owenmore River at a location near Bangor Erris, where the river spilled over its banks on 12 July 1997 after 49.5 mm of rain had fallen in Bangor Erris over a 2-hour period. As presented in Chapter 9 of the EIAR, this equates to a 100-year rainfall event.

## 2.2 OPW River Flood Extents and Indicative Fluvial Flood Maps

OPW's National River Flood Extent Mapping[1] does not show any river flood extents within or downstream of the Proposed Development area. However, as reproduced in **Figure 1**, the National Indicative Fluvial Mapping[2] shows OPW-modelled "*low probability*" and "*medium probability*" fluvial flooding immediately east and downstream of Sheskin Forest, *i.e.,* outside the Proposed Development area boundary.

It is recognised that OPW's flood extent maps are modelled flood extents and not actual past, recorded flood extents. The OPW modelling is based on "*estimated probability of occurrence, rather than information for actual floods that have occurred in the past*." As stated by OPW on the Floodinfo website[3], "*Flooding from other reaches of river may occur, but has not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk of flooding from unmodelled rivers (as well as from other sources)*."

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[1] Modelled extents of land that might be flooded by rivers (fluvial flooding) in a very extreme flood event, defined by: a) Low Probability flood events with an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%; b) Mid-Range Future Scenario extents which consider the potential effects of climate change using an increase in rainfall of 20% and sea level rise of 500mm (20 inches).

[2] Modelled extents of land that might be flooded by rivers (fluvial flooding) during a theoretical or 'design' flood event with an estimated probability of occurrence. Medium probability events are defined by AEP of 1% (or 100 year return period). Low probability events are defined by AEP of 0.1% (or 1000 year return periods).

[3] https://www.floodinfo.ie/map/floodmaps/ (last accessed 18 January 2023).

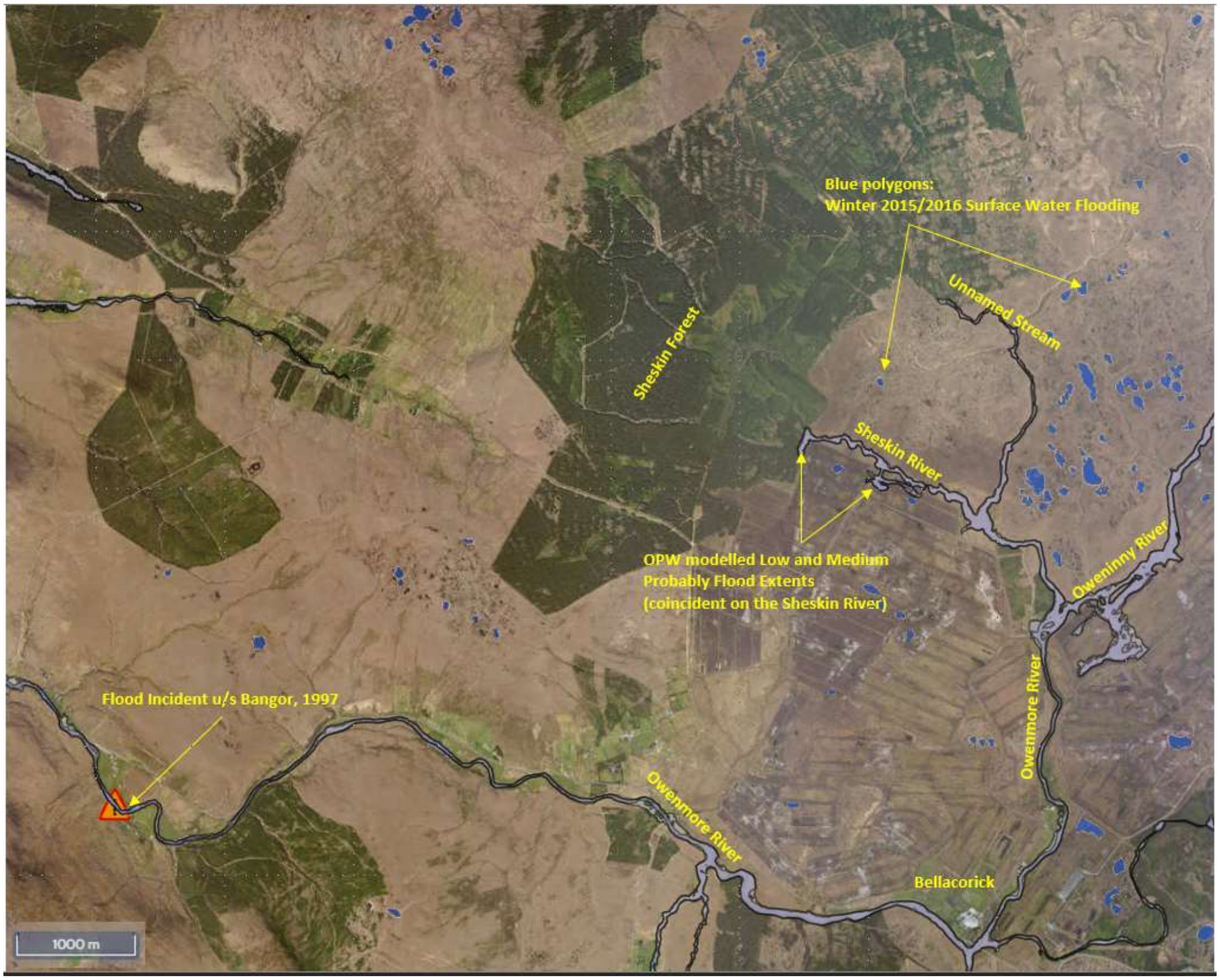


**Figure 1: Flood Area Identification From OPW Mapping**

That said, there are no records and were no visible signs noted (see below) of past flooding within the Proposed Development area. In combination, the OPW modelling and available other information indicates that the planned wind farm infrastructure is located in Flood Zone C (Low Risk).

## 2.3 Groundwater Flooding

Based on GSI's Groundwater Flooding Probability Mapping, there are no groundwater flood zones in the Proposed Development area or immediately downgradient.

## 2.4 Other Relevant Mapping

Historical Ordnance Survey Ireland (OSI) 6- and 25-inch mapping do not indicate locations that are "*prone to flooding*" within the Proposed Development area. However, the area between Sheskin Forest and the Oweninny/Owenmore Rivers is marked by low-gradient, boggy ground with numerous "rises" (i.e., seeps and springs) along the Sheskin River that naturally serve to maintain water-logged conditions on natural floodplains.

The GSI's 'Winter 2015/2016 Surface Water Flooding' map (**Figure 1**) shows ponded areas which reflect fluvial (rivers) and pluvial (rain) floods in Ireland during the winter 2015/2016 floods based on remote sensing imagery.[4] There was no flooding directly within the Proposed Development area but there was ponding (manifested as water logging) in flat-lying bog areas to the east of Sheskin Forest, which is a recurring winter occurrence. In the 2015/2016 winter season, the GSI has also recorded small ponding in the northwestern portion of Sheskin Forest, which reflects water collection in a small topographic basin.

## 2.5 Summary of Flood Risk Identification

The Proposed Development is located outside any fluvial flood zones (Flood Zones A-B). The planned infrastructure is situated at elevations which are higher than the OPW-modelled 1,000-year flood level, and will be situated higher than, and outside, 50 m buffer zones along water courses within Sheskin Forest. Hence, all of the planned infrastructure is situated in Flood Zone C (Low Risk), which is defined by a less than 0.1% probability of flooding.

# 3. Initial Flood Risk Assessment

Walkover surveys in Sheskin Forest were undertaken by CDM Smith in July 2021. Drainage conditions within the forest have not changed since then, hence the observation from July 2021 are considered representative of present-day.

The walkover surveys identified existing forestry drains as the primary drainage routes towards the natural streams within Sheskin Forest. The streams are small but the water courses are well defined in the landscape, with relatively steep slopes on either side. There was no evidence of out-of-bank flow from the various tributaries or forest drains.

As presented in Chapter 9 of the EIAR, mapped soil types in the Proposed Development area comprises blanket peat and smaller pockets of poorly drained mineral soils derived from glacial till. Alluvium sediments are only mapped along the Oweninny and Owenmore Rivers.

Several small streams within the Proposed Development area originate as headwater seeps or springs at higher ground within Sheskin Forest. These gradually merge in the downstream direction to form a) the Sheskin River, which drains the southern part of Sheskin Forest, and b) an unnamed stream which drains the northern part of the forest. In turn, the Sheskin River and the unnamed stream merge approximately 1.5 km downstream of the Proposed Development site boundary, and continue to flow as Sheskin River east to the Oweninny River, where flow continues as the Owenmore River to the south and turning west at Bellacorick.

Both the Sheskin River and unnamed stream are ungauged. However, as detailed in Chapter 9 of the EIAR, the estimated mean combined flow of the two water courses based on EPA's Qube model of streamflow in ungauged catchments is approximately 1.04 $m^3/s$. The sum of peak streamflows, represented by the 1-percentile flow, is 5.90 $m^3/s$.

Conceptually, the principal flood risk within the Proposed Development area is fluvial flooding resulting from overland flow (runoff) of rainwater, driven by the existing slopes. Runoff may be enhanced as the underlying bedrock is considered 'poorly productive', which means it has limited capacity to infiltrate or recharge all of the rainfall across the catchment.

Conceptually, fluvial flooding is manifested as overbank spills and fluvial flood risk increases in the downstream direction. In the case of Sheskin River, fluvial flood risk becomes relevant on the flatter terrain to the east of

[4] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc

Sheskin Forest and outside the Proposed Development area, which is also indicated by OPW's modelled flood extent mapping (**Figure 1**).

Existing infrastructure east of Sheskin Forest comprises sparse houses/dwellings in the townland of Srahnakilly near the confluence of the Sheskin and Oweninny Rivers, and the secondary road which extends north from the N59 at the Bellacorrick power station, and which runs parallel to the south-flowing Owenmore River.

Within the Proposed Development area, the flood risk associated with planned infrastructure is low. All infrastructure (turbines, compounds, substation and borrow pits) are also deliberately situated at least 50 m from watercourses, by design. Only access roads will cross this 50 m buffer zone, and all water courses at bridge crossings will be culverted.

To the east and downstream of the Proposed Development area, the gentle/flat terrain is naturally water-logged/boggy. During wet weather events, the ground saturates from rainfall (pluvial flooding) as well as greenfield runoff from Sheskin Forest and water flow through the blanket peat.

As there will be no net change to the greenfield hydrological conditions in Sheskin Forest as a result of the Proposed Development, the Proposed Development will not influence the natural hydrological conditions of the floodplains of the Sheskin, Oweninny or downslope Owenmore Rivers.

# 4. Justification Tests

## 4.1 Vulnerability

The Planning System and Flood Risk Management Guidelines present flood risk in terms of flood zones A, B, and C, which correspond to areas of high, medium, or low probability of flooding, respectively. The extents of each flood zone are based on the Annual Exceedance Probability (AEP) of various flood events.

The referenced guidelines also categorise diverse types of development into three vulnerability classes based on their sensitivity to flooding. Because the Proposed Development consists of electricity-generating infrastructure, the development is considered a "Highly Vulnerable Development."

**Table 1** below presents a decision matrix which indicates which types of development are appropriate in each flood zone and when the criteria of the 'Justification Test' included in the guidance document must be satisfied.

**Table 1: Decision Matrix for Determining the Appropriateness of a Development**

| Flood Zone (Probability) | Annual Exceedance Probability (AEP) | Development Appropriateness | | |
|---|---|---|---|---|
| | | Highly Vulnerable | Less Vulnerable | Water Compatible |
| A (High) | Fluvial & Pluvial Flooding<br>More frequent than 1% AEP<br>Coastal Flooding<br>More frequent than 0.5% AEP | Justification Test | Justification Test | Appropriate |
| B (Medium) | Fluvial & Pluvial Flooding<br>0.1% to 1% AEP<br>Coastal Flooding<br>0.1% to 0.5% AEP | Justification Test | Appropriate | Appropriate |
| C (Low) | Fluvial, Pluvial & Coastal Flooding<br>Less frequent than 0.1% AEP | Appropriate | Appropriate | Appropriate |

The Proposed Development site is located entirely outside a mapped flood zone A or B. The location of the electrical substation is also at a higher elevation than the Low Probability event and MRFS level. For this reason, the Proposed Development is considered "appropriate" from a flood risk perspective and the justification does not need to be applied.

## 4.2 Planning Policy

Chapter 11 of Mayo County Council's (MCC) County Development Plan (2022-2028) incorporates several supporting statements for wind energy development (MCC, 2022). The council's Renewable Energy Strategy (RES) also includes maps that identify "priority" and "preferred" areas for wind farm development, as well as "locations open for consideration" (MCC, 2011).

The county development plan specifically states that "The Council will endeavour to continue to facilitate wind energy projects that accord with the Mayo RES, the Landscape Appraisal of County Mayo and relevant Section 28 ministerial guidelines". Furthermore, the county's rural energy policy #7 is "To promote the harnessing of wind energy to contribute toward decarbonising County Mayo, including new emerging by-product markets".

With regard to flood risk, the county development plan incorporates a Strategic Flood Risk Assessment (SFRA) which includes mapped boundaries for indicative flood risk zones that account for factors such as local knowledge, site walkovers and flood risk indicators. Neither the Proposed Development nor downstream areas feature in the county SFRA.

However, the SFRA contains numerous principles and policies which have been factored into the proposed drainage design for the Proposed Development. For example, MCC advocates surface water management through Sustainable Urban Drainage Systems (SuDS) to minimise the effects on flooding and pollution of water courses through engineering solutions, including ponds, swales, filter drains or other installations.

In the context of flood risk, the county SFRA sets the following surface water objectives (SWOs):

- SWO 16: "To support, promote and facilitate the use of green infrastructure …. in the interests of flood mitigation….."
- SWO 17: "To require the use of SuDS …. to reduce the potential impact of existing and predicted flooding risks."
- SWO 18: "To ensure new development is adequately serviced with surface water drainage infrastructure, which meets the requirements of the Water Framework Directive, associated River Basin Management Plans and Catchment Flood Risk Assessment Management (CFRAM) Plans".

The Proposed Development and the associated drainage design are consistent with these requirements. Many of the proposed drainage solutions are SuDS-based and SuDS-compatible, and the referenced plans have been included in the overall assessment of likely significant effects.

Specific, relevant SFRA objectives which are included in the county SFRA are summarised in **Table 2**, along with notes on how the planning application addresses the objectives.

**Table 2: County Mayo SFRA Objectives and Responses in Planning Application**

| Objective No. | SFRA Objective | Response in Planning Application |
|---|---|---|
| 19 | *"To ensure that a flood risk assessment is carried out for any development proposal where a flood risk is identified in accordance with the Planning System and Flood Risk* | A Stage 2 FRA was conducted based on the DEHLG Guidelines document and OPW flood risk mapping. |

| Objective No. | SFRA Objective | Response in Planning Application |
|---|---|---|
| | *Management (DEHLG/OPW 2009) and Circular PL2/2014. This assessment shall be appropriate to the scale and nature of risk to the potential development."* | |
| 20 | *"To consult with the OPW in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible and retain a strip on either side of such channels where required, to facilitate maintenance access thereto."* | The proposed drainage design includes a 50 m buffer assigned to each water course, within which infrastructure, including discharges, will be avoided. |
| 22 | *"To protect the integrity of any formal (OPW or Mayo County Council) flood risk management infrastructure, thereby ensuring that any new development does not negatively impact any existing defence infrastructure or compromise any proposed new infrastructure."* | Checks were conducted and found to be not applicable in this instance. |
| 23 | *"To ensure that where flood risk management works take place that natural heritage, cultural heritage, rivers, streams and watercourses are appropriately protected."* | This was considered in the proposed drainage design. |
| 24 | *"To consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the County."* | Responses of statutory consultees were considered. |
| 25 | *"To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time."* | Climate change effect (increased rainfall) was considered in the proposed drainage design. |
| 27 | *"To identify and preserve vulnerable floodplains, wetlands and coastal areas to the maximum possible extent in both urban and rural areas."* | Not applicable in this instance. |

# 5. Summary of Proposed Drainage System

The proposed drainage system has been integrated with the existing drainage system which serves the Sheskin Forest operations to date. The proposed drainage system will not change the existing hydrological conditions within the Proposed Development site, but some of the runoff water will be redirected and/or discharged diffusely uses level spreaders or via new settlement ponds. There will be no direct discharges to water courses. Instead, water will be discharged in controlled/managed manners, by spreading out across open ground to discharge at greenfield runoff rates. A 50 m buffer along all water courses will be maintained during construction which will serve to limit sediment transport to streams.

Upstream of new infrastructure components, e.g., turbines and their hardstanding, greenfield runoff will be intercepted to bypass works areas. In working areas and downslope of roads, 'dirty water' will be intercepted via swales and directed to dedicated settlement ponds for removal of suspended solids prior to controlled discharge as indicated above.

Streams intercepted by access roads will be crossed by clear-span culverts. The culverts will be designed to accommodate 100-year flood events. Grid cables which traverse streams will be passed across the culverts or through horizontal borings beneath streambeds, depending on location-specific conditions.

Flow along interceptor drains upslope of access roads and swales downslope of works areas will be buffered with check dams at regular intervals to help break the energy of flow, settle out any suspended sediments, and reduce sediment load to streams. Spacing of such dams will depend on slope, but will generally be every 50 m (or less) depending on slope. Discharges will be dispersed across vegetation and dilute with greenfield runoff as stated above.

The Proposed Development is divided into subcatchments for each infrastructure component and segment of access road between streams. The runoff associated with each subcatchment is calculated and serves to guide the placement of settlement ponds. The settlement ponds will be dimensioned to provide temporary storage for runoff that is defined by 6-hour duration, 10-year return storm events.

# 6. Summary of FRA

The flood risk associated with the Proposed Development is low. This is mainly because of the topographic characteristics, including slopes, of the Proposed Development area. During walkover surveys, there was no visible evidence of flooding within the surveyed sections of Sheskin Forest. The Proposed Development and its associated drainage system will not increase or otherwise change fluvial flood risk within or downstream of Sheskin Forest. The proposed drainage system will serve to control discharges of runoff waters to streams at greenfield runoff rates using a combination of interceptor drains, check dams, swales, settlement ponds, and buffered, disperse outfalls. The majority of discharges will be outside a 50 m buffer zone along all water courses..

There is limited infrastructure present downgradient of the Proposed Development. The Proposed Development is compatible with the objectives of the County Mayo Development Plan (2022-2028) and the county-wide SFRA.

# 7. References

DEHLG/OPW (2009). The Planning System and Flood Risk Management. Guidelines for Planning Authorities. November 2009. Accessible from: https://www.opr.ie/wp-content/uploads/2019/08/2009-Planning-System-Flood-Risk-Mgmt-1.pdf

MCC (2022). Mayo County Development Plan 2022-2028. Accessible from: https://www.mayo.ie/planning/county-development-plans/2022-2028

MCC (2011). Renewable Energy Strategy for County Mayo (2011-2020). Accessible from: https://www.mayo.ie/getmedia/6c162d3e-ed53-47ae-9b47-9d870df29397/1-Document1,16467,en.pdf

# APPENDIX 9-2

## SURFACE WATER QUALITY LABORATORY REPORTS

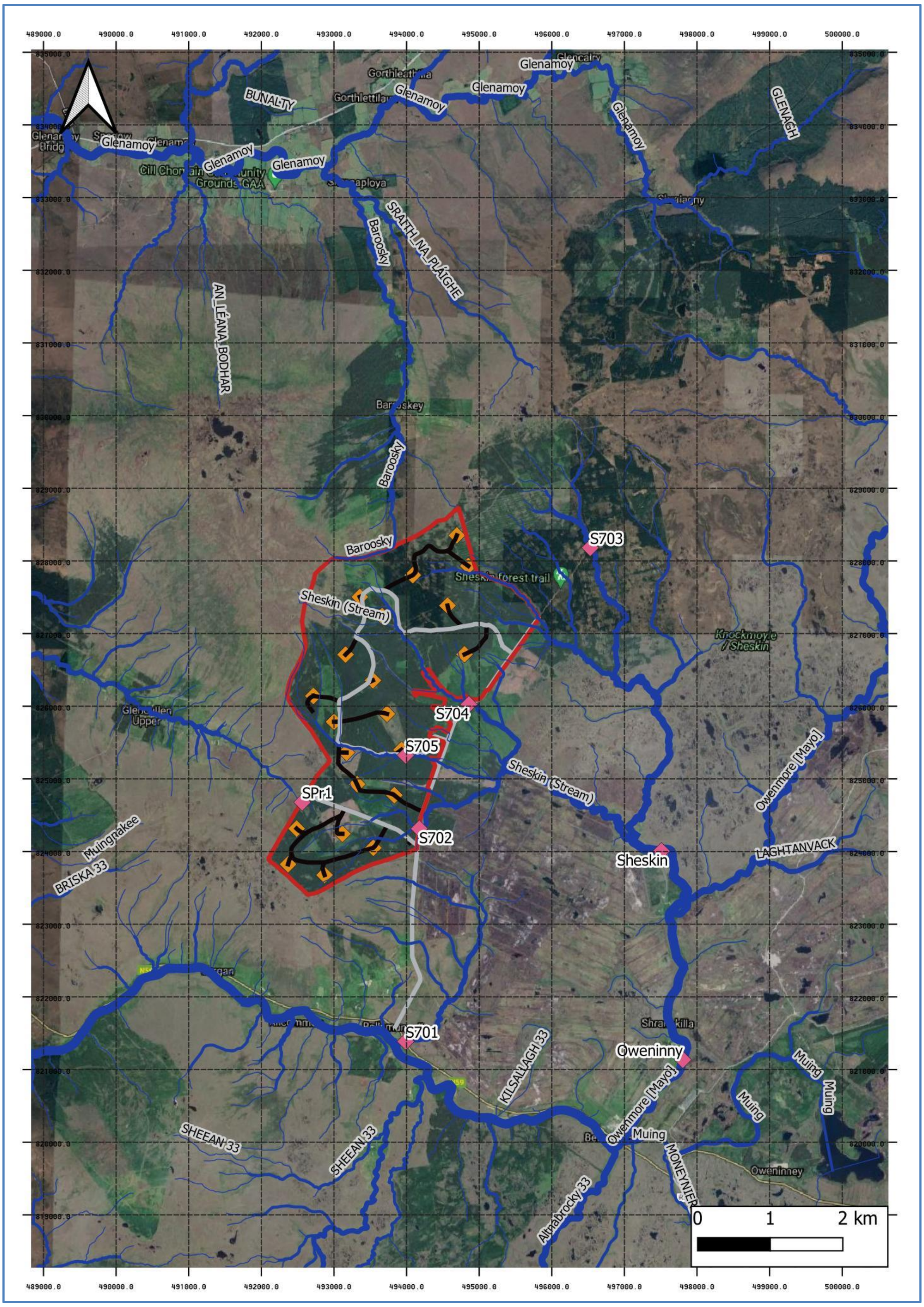


*Figure 3-12 Surface water samples*

eurofins Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

# Final Report

| | | | |
|---|---|---|---|
| **Report No.:** | 20-33177-1 | | |
| **Initial Date of Issue:** | 15-Dec-2020 | | |
| **Client** | Tobin Consulting Engineers | | |
| **Client Address:** | Block 10-4<br>Blanchardstown Corporate Park<br>Dublin 15<br>Dublin<br>Ireland | | |
| **Contact(s):** | John Dillon | | |
| **Project** | 10968 Sheskin | | |
| **Quotation No.:** | | **Date Received:** | 10-Dec-2020 |
| **Order No.:** | | **Date Instructed:** | 10-Dec-2020 |
| **No. of Samples:** | 5 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 15-Dec-2020 |
| **Date Approved:** | 15-Dec-2020 | | |
| **Approved By:** | | | |
| **Details:** | Glynn Harvey, Technical Manager | | |

# Results - Water

**Project: 10968 Sheskin**

| **Client: Tobin Consulting Engineers** | | | | **Chemtest Job No.:** | 20-33177 | 20-33177 | 20-33177 | 20-33177 | 20-33177 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: | | | | **Chemtest Sample ID.:** | 1108094 | 1108095 | 1108096 | 1108097 | 1108098 |
| | | | | Sample Location: | S701 | S703 | Oweninny | Sheskin | S705 |
| | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER |
| | | | | Date Sampled: | 09-Dec-2020 | 09-Dec-2020 | 09-Dec-2020 | 09-Dec-2020 | 09-Dec-2020 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 10 | < 5.0 | 12 | < 5.0 | < 5.0 |
| Chloride | U | 1220 | mg/l | 1.0 | 21 | 17 | 17 | 16 | 22 |
| Phosphorus (Total) | N | 1220 | mg/l | 0.020 | 0.021 | < 0.020 | < 0.020 | < 0.020 | < 0.020 |
| Ammonia (Free) | U | 1220 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Orthophosphate as PO4 | U | 1220 | mg/l | 0.050 | 0.064 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Dissolved Organic Carbon | U | 1610 | mg/l | 2.0 | 19 | 16 | 17 | 16 | 23 |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO. 166T

Report No: TCEG-636020921
Document No: EF0011

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Client** | **Tobin Consulting Engineers**<br>Block 10-4<br>Blanchardstown Corporate Park<br>Dublin 15 | **Date Received** | 02/09/2021 |
| | | **Date Reported** | 14/09/2021 |
| | | **Order Number** | 10889 |

**For the Attention of:** John Dillon

**Sample Reception** 3 sample(s) received in good condition.

**Comments** N/A

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

*Conditions:*
*1. Results in this report relate only to the items tested*
*2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
*3. All queries regarding this report should be addressed to the Technical Manager at the above address*
*4. A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
*5. Results reported as CFU/cm² are calculated based on information supplied by customer regarding area swabbed*
*6. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test*
*7. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test*
*8. Where sampling is undertaken by ALS personnel, sampling activities are outside the scope of INAB accreditation*
*9. Dil next to a method reference indicates that a dilution of the water sample was undertaken during testing*

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Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
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ISO 17025 INAB ACCREDITED TESTING
DETAILED IN SCOPE REG NO. 166T

Report No: TCEG-636020921

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 02/09/2021
**Date Reported** 14/09/2021
**Order Number** 10889

**Sample Type** Water
**Client ID** 02/09/2021 Sheskin 1
**Date Tested** 03/09/2021
**ALS ID** 4649231

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 22.5 | mg/l Cl | P281 |
| Conductivity @ 20°C | 142 | µs/cm | P284 |

**Sample Type** Water
**Client ID** 02/09/2021 Oweninny
**Date Tested** 03/09/2021
**ALS ID** 4649232

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 19.7 | mg/l Cl | P281 |
| Conductivity @ 20°C | 151 | µs/cm | P284 |

**Sample Type** Water
**Client ID** 02/09/2021 Sheskin 2
**Date Tested** 03/09/2021
**ALS ID** 4649236

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 20.7 | mg/l Cl | P281 |
| Conductivity @ 20°C | 140 | µs/cm | P284 |

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

ALS Life Sciences Ltd
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Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
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INAB ISO 17025 ACCREDITED TESTING
DETAILED IN SCOPE REG NO.166T

Report No: TCEG-689010421
Document No: EF0011

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Client** | **Tobin Consulting Engineers**<br>Block 10-4<br>Blanchardstown Corporate Park<br>Dublin 15 | **Date Received**<br>**Date Reported**<br>**Order Number** | 01/04/2021<br>12/04/2021<br>10968 |

**For the Attention of:** John Dillon

**Sample Reception** 4 sample(s) received in good condition.

**Comments** N/A

Report Authorised by: David Kinsella

David Kinsella
Deputy Environmental Chemistry Manager

*Conditions:*
*1. Results in this report relate only to the items tested*
*2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
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*7. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test*
*8. Where sampling is undertaken by ALS personnel, sampling activities are outside the scope of INAB accreditation*
*9. Dil next to a method reference indicates that a dilution of the water sample was undertaken during testing*

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: TCEG-689010421
Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 01/04/2021
**Date Reported** 12/04/2021
**Order Number** 10968

**Sample Type** Water
**Client ID** 01/04/2021 S701
**Date Tested** 01/04/2021
**ALS ID** 4419744

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| COD Total | 33 | mg/l O2 | P210 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Nitrite | <0.01 | mg/l NO2N | P281 |
| Chloride | 26.0 | mg/l Cl | P281 |
| Conductivity @ 20°C | 132 | µs/cm | P284 |

**Sample Type** Water
**Client ID** 01/04/2021 S702
**Date Tested** 01/04/2021
**ALS ID** 4419745

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| COD Total | 47 | mg/l O2 | P210 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Nitrite | <0.01 | mg/l NO2N | P281 |
| Chloride | 28.3 | mg/l Cl | P281 |
| Conductivity @ 20°C | 107 | µs/cm | P284 |

Report Authorised by: David Kinsella

David Kinsella
Deputy Environmental Chemistry Manager

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 21-25981-2 | | |
| **Initial Date of Issue:** | 03-Aug-2021 | **Date of Re-Issue:** | 19-Oct-2021 |
| **Client** | Tobin Consulting Engineers | | |
| **Client Address:** | Block 10-4<br>Blanchardstown Corporate Park<br>Dublin 15<br>Dublin<br>Ireland | | |
| **Contact(s):** | John Dillon | | |
| **Project** | 10968 Sheskin | | |
| **Quotation No.:** | Q21-24896 | **Date Received:** | 28-Jul-2021 |
| **Order No.:** | | **Date Instructed:** | 28-Jul-2021 |
| **No. of Samples:** | 11 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 03-Aug-2021 |
| **Date Approved:** | 03-Aug-2021 | | |

**Approved By:**

**Details:** Glynn Harvey, Technical Manager

# Results - Water

**Project: 10968 Sheskin**

| **Client: Tobin Consulting Engineers** | | | | **Chemtest Job No.:** | 21-25981 | 21-25981 | 21-25981 | 21-25981 | 21-25981 | 21-25981 | 21-25981 | 21-25981 | 21-25981 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q21-24896 | | | | **Chemtest Sample ID.:** | 1249479 | 1249480 | 1249481 | 1249482 | 1249483 | 1249484 | 1249485 | 1249486 | 1249487 |
| | | | | Client Sample ID.: | S701 | S702 | S703 | S704 | S705 | S706 | S707 | S708 | S709 |
| | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | Date Sampled: | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 | 21-Jul-2021 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| pH | U | 1010 | | N/A | 8.1 | 8.0 | 7.9 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.8 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 150 | 120 | 120 | 96 | 130 | 110 | 130 | 130 | 140 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 11 | < 5.0 | < 5.0 | 14 | 6.0 | 5.0 | < 5.0 | 6.0 | 7.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | [B] < 10 | [B] < 10 | [B] 14 | [B] 23 | [B] 160 | [B] < 10 | [B] 44 | [B] < 10 | [B] 54 |
| Chloride | U | 1220 | mg/l | 1.0 | 21 | 31 | 16 | 17 | 18 | 21 | 17 | 22 | 19 |
| Ammonium | U | 1220 | mg/l | 0.050 | < 0.050 | 0.19 | < 0.050 | < 0.050 | < 0.050 | 0.32 | < 0.050 | < 0.050 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | 15 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | 1.6 |
| Phosphorus (Total) | N | 1220 | mg/l | 0.020 | 0.029 | 0.031 | 0.50 | 0.32 | 0.25 | 0.24 | 0.19 | 0.19 | 0.021 |

# Results - Water

**Project: 10968 Sheskin**

| **Client: Tobin Consulting Engineers** | | | | **Chemtest Job No.:** | 21-25981 | 21-25981 |
|---|---|---|---|---|---|---|
| Quotation No.: Q21-24896 | | | | **Chemtest Sample ID.:** | 1249488 | 1249490 |
| | | | | Client Sample ID.: | S710 | O701 |
| | | | | Sample Type: | WATER | WATER |
| | | | | Date Sampled: | 21-Jul-2021 | 21-Jul-2021 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| pH | U | 1010 | | N/A | 7.8 | 7.8 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 110 | 200 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 6.0 | 18 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | [B] 78 | [B] 37 |
| Chloride | U | 1220 | mg/l | 1.0 | 17 | 22 |
| Ammonium | U | 1220 | mg/l | 0.050 | < 0.050 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | 0.61 |
| Phosphorus (Total) | N | 1220 | mg/l | 0.020 | 0.18 | 0.021 |

# Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|---|
| 1249479 | | S701 | | 21-Jul-2021 | B | Miscellaneous |
| 1249480 | | S702 | | 21-Jul-2021 | B | Miscellaneous |
| 1249481 | | S703 | | 21-Jul-2021 | B | Miscellaneous |
| 1249482 | | S704 | | 21-Jul-2021 | B | Miscellaneous |
| 1249483 | | S705 | | 21-Jul-2021 | B | Miscellaneous |
| 1249484 | | S706 | | 21-Jul-2021 | B | Miscellaneous |
| 1249485 | | S707 | | 21-Jul-2021 | B | Miscellaneous |
| 1249486 | | S708 | | 21-Jul-2021 | B | Miscellaneous |
| 1249487 | | S709 | | 21-Jul-2021 | B | Miscellaneous |
| 1249488 | | S710 | | 21-Jul-2021 | B | Miscellaneous |
| 1249490 | | O701 | | 21-Jul-2021 | B | Miscellaneous |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using ‘Aquakem 600’ Discrete Analyser. |

# Report Information

| Key | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |
| SOP | Standard operating procedure |
| LOD | Limit of detection |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

**Sample Deviation Codes**

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

**Sample Retention and Disposal**

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: TCEG-689010421
Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 01/04/2021
**Date Reported** 12/04/2021
**Order Number** 10968

**Sample Type** Water
**Client ID** 30/03/2021 O701
**Date Tested** 01/04/2021
**ALS ID** 4419746

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| COD Total | 32 | mg/l O2 | P210 |
| Ammonium | <0.03 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Nitrite | <0.01 | mg/l NO2N | P281 |
| Chloride | 24.9 | mg/l Cl | P281 |
| Conductivity @ 20°C | 134 | µs/cm | P284 |

**Sample Type** Water
**Client ID** 01/04/2021 SPr1
**Date Tested** 01/04/2021
**ALS ID** 4419747

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| COD Total | 35 | mg/l O2 | P210 |
| Ammonium | 0.04 | mg/l NH4 | P281 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Nitrite | <0.01 | mg/l NO2N | P281 |
| Chloride | 27.0 | mg/l Cl | P281 |
| Conductivity @ 20°C | 103 | µs/cm | P284 |

Report Authorised by: David Kinsella

David Kinsella
Deputy Environmental Chemistry Manager

# APPENDIX 9-3

## DRAINAGE DESIGN CALCULATIONS

# Appendix 9-3 Drainage Design Calculations

## 1. Introduction

CDM Smith Ireland Ltd (CDM Smith) was requested by MKO, on behalf of Sheskin South Renewables Power Designated Activity Company (DAC), to calculate drainage rates and volumes associated with planned wind farm development (Proposed Development) at Sheskin, Co. Mayo.

### 1.1 Purpose of Assessment

The purpose of the calculations is to estimate and communicate drainage rates and volumes of runoff from greenfield areas and infrastructure locations within the Proposed Development site. The calculations serve to guide the planning of drainage for construction and operations of the Proposed Development.

The calculations specifically address 'greenfield' runoff within Sheskin Forest and runoff from access roads and hardstanding that accompany the different infrastructure components of the Proposed Development.

The calculations make use of information from Chapter 2 (Project Description) and Chapter 9 (Hydrology and Hydrogeology) of the EIAR. The calculations have been prepared in conjunction with the proposed drainage layout presented in Appendix 4-4.

### 1.2 Statement of Authority

Established in Ireland since 2001, CDM Smith's ISO 9001, ISO 14001 and OHSAS 18001 - accredited Dublin office works on a diverse range of water and environmental projects for public and private sector clients, including the preparation of drainage designs for flood risk and environmental protection initiatives.

The calculations presented herein were prepared by Henning Moe (registered P. Geo.), a hydrogeologist with over 30 years of practical experience, supported by Masoud Mahdisoltani, a water resources engineer with 6 years of experience conducting hydraulic analyses for flood hazard studies and drainage network designs. Jon Hunt (registered P. Geo.), a geologist with over 20 years of practical experience, conducted site walkover surveys, and Ruairi O'Carroll (CEng MIEI), a chartered engineer with over 20 years of practical experience, provided technical review.

## 2. Basis of Calculations

### 2.1 Greenfield Runoff

Greenfield runoff represents 'clean water' which is intercepted upstream of access roads and infrastructure components of the Proposed Development. This water is led to existing forestry drains or water courses (i.e., where the runoff water already discharges).

Calculations are based on the 'IH-124 method' for small catchments (Marshall and Bayliss, 1994) which is a pragmatic and commonly applied method for this type of assessment. The IH-124 method calculates 'Qbar' which is the peak rate of flow from a subcatchment for the mean annual flood with a return period of approximately 2 years. Qbar is calculated from the following equation:

$$\text{Qbar (m}^3\text{/s)} = 0.00108 \times (0.01\times\text{AREA})^{0.89} \times \text{SAAR}^{1.17} \times \text{SPR}^{2.17}$$

Where,

- AREA = subcatchment area ($m^2$).

- SAAR = standard annual average rainfall (mm/yr).
- SPR = standard percentage runoff coefficient for the applicable SOIL category in the subcatchment area. The SOIL category is measure of winter rainfall acceptance potential, as a percent of rainfall. Soils are classified from S1 to S5 based on runoff potential. S1 has a low runoff value while S5 has a higher runoff potential.

Qbar, which is an 'index flood' (a mean annual peak flood) was subsequently modified to a 'design flood' for a 1 in 10 year storm event by multiplying Qbar with a national flood frequency growth factor of 1.35 for a 1 in 10 year return period storm, based on Cawley and Cunnane, 2003. This raises the greenfield runoff volume to account for rainfall conditions that are reflected by storm-events rather than an annual average.

## 2.2 Runoff from Access Roads and Hardstanding

Runoff from new access roads and hardstanding represents 'dirty water' which is intercepted by engineered swales downstream of access roads and infrastructure components. The water is led to settlement (stilling) ponds before being discharged to nearby streams. These are established prior to construction of facilities, and the swales and ponds remain in place during all subsequent phases of the Proposed Development.

Runoff calculations for access roads and hardstanding are based the 'Rational Method' (Mulvaney, 1851), which is represented by the following equation:

$$Q = c \times I \times A$$

Where,

- Q = peak runoff rate ($m^3/s$).
- c = runoff coefficient, an empirical coefficient representing a relationship between rainfall and runoff.
- I = rainfall intensity for the design return period (mm/hr).
- A = subcatchment area ($m^2$)

A conservative instantaneous time of entry is assumed. The calculation was carried out for a 6-hour duration, 1 in 10 year return period, storm. The duration of construction of the Proposed Development is 2 years (maximum), and it is reasonable to expect a 1 in 10 year storm event during this construction period.

## 2.3 Sizing of Settlement Ponds

The sizing of settlement ponds incorporated in the drainage of 'dirty water' is based on the following equation:

$$A = Q/Vs$$

Where:

- A = area of pond ($m^2$)
- Q = flow into pond ($m^3/s$)
- Vs = settling velocity (m/s) of fine silt-grade particles, selected to be 10 µm (0.01 mm) in size, reflecting the need to settle out fines given the Water Framework Directive (WFD) High Status objective and High Status (2016-2021) of the Sheskin River (see Appendix 9-4).

Vs is calculated from Stoke's Law:

$$V_s = [2 \times r^2 \times g \times (D_p - D_f)] / (9 n)$$

Where,

- r is the radius of the particle (m)
- g is gravity (9.80665 $m/s^2$)
- $D_p$ is the density of the particles ($kg/m^3$), taken to be 2,400 $kg/m^3$
- $D_f$ is the density of the fluid ($kg/m^3$), taken to be 1,000 $kg/m^3$
- n is the dynamic viscosity of the fluid (0.001308 kg/ m sec @ 10°C)

Hence, for a 10 µm particle, Vs = 0.000234 m/s.

# 3. Results

## 3.1 Greenfield Runoff

Runoff calculations from subcatchments of greenfield areas are presented in **Table 1**. The subcatchments were delineated from detailed topographic maps based on Lidar surveys and are presented in Chapter 9 of the EIAR. The calculated Qbar values range from 0.001 to 0.381 $m^3/s$, for a sum of 7.038 $m^3/s$.

**Table 1: Calculated Greenfield Runoff Rates**

| Subcatchment | Subcatchment Area ($m^2$) | As % of Proposed Development Site | Qbar ($m^3/s$) |
|---|---|---|---|
| A1 | 49,480.9 | 0.4% | 0.096 |
| A2 | 63,564.8 | 0.5% | 0.119 |
| A3 | 70,810.6 | 0.6% | 0.131 |
| A4 | 6,102.2 | 0.1% | 0.015 |
| A5 | 29,862.6 | 0.3% | 0.061 |
| A6 | 55,369.6 | 0.5% | 0.105 |
| A7 | 81,072.3 | 0.7% | 0.149 |
| A8 | 63,598.0 | 0.5% | 0.119 |
| A9 | 20,931.9 | 0.2% | 0.045 |
| A10 | 82,014.1 | 0.7% | 0.150 |
| A11 | 75,306.2 | 0.6% | 0.139 |
| A12 | 11,280.7 | 0.1% | 0.026 |
| A13 | 99,810.0 | 0.8% | 0.178 |
| A14 | 156,603.9 | 1.3% | 0.266 |
| A15 | 75,740.5 | 0.6% | 0.139 |
| A16 | 109,866.1 | 0.9% | 0.194 |
| A17 | 39,677.2 | 0.3% | 0.078 |
| A18 | 140,920.2 | 1.2% | 0.242 |
| A19 | 29,837.8 | 0.0% | 0.001 |
| A20 | 21,131.7 | 0.3% | 0.061 |
| A21 | 167,646.7 | 0.2% | 0.045 |
| A22 | 71,449.3 | 1.4% | 0.282 |
| A23 | 235,536.8 | 0.6% | 0.132 |

| Subcatchment | Subcatchment Area ($m^2$) | As % of Proposed Development Site | Qbar ($m^3/s$) |
|---|---|---|---|
| A24 | 102,652.0 | 2.0% | 0.381 |
| A25 | 24,958.0 | 0.9% | 0.182 |
| A26 | 232,751.4 | 0.2% | 0.053 |
| A27 | 19,220.3 | 2.0% | 0.377 |
| A28 | 65,561.9 | 0.2% | 0.042 |
| A29 | 24,050.0 | 0.6% | 0.123 |
| A30 | 24,638.1 | 0.2% | 0.050 |
| A31 | 65,648.8 | 0.2% | 0.051 |
| A32 | 53,565.2 | 0.6% | 0.123 |
| A33 | 171,330.0 | 0.5% | 0.103 |
| A34 | 76,753.1 | 1.4% | 0.288 |
| A35 | 17,781.9 | 0.6% | 0.140 |
| A36 | 78,078.3 | 0.1% | 0.039 |
| A37 | 52,256.2 | 0.7% | 0.143 |
| A38 | 157,457.5 | 0.4% | 0.100 |
| A39 | 113,716.0 | 1.3% | 0.266 |
| A40 | 141,954.3 | 1.0% | 0.200 |
| A41 | 38,393.3 | 1.2% | 0.243 |
| A42 | 14,339.3 | 0.3% | 0.077 |
| A43 | 31,091.7 | 0.1% | 0.032 |
| A44 | 100,076.4 | 0.3% | 0.063 |
| A45 | 4,982.6 | 0.8% | 0.178 |
| A46 | 117,731.0 | 0.0% | 0.014 |
| A47 | 26,011.7 | 1.0% | 0.207 |
| A48 | 76,327.2 | 0.2% | 0.054 |
| A49 | 49,692.6 | 0.6% | 0.140 |
| A50 | 218,035.0 | 0.4% | 0.096 |
| A51 | 10,061.6 | 1.8% | 0.356 |
| A52 | 22,190.1 | 0.1% | 0.024 |
| A53 | 37,097.7 | 0.2% | 0.047 |
| **Sum** | **3,888,920** | **32.8%** | **7.038** |

## 3.2 Runoff From Access roads and Hardstanding

Based on Chapter 9 of the Hydrology and Hydrogeology Chapter, the rainfall depth for the 6-hour, 10-year storm event is 41.6 mm, which equates to a rainfall intensity of 6.93 mm/hr.

For access roads and hardstanding, a runoff coefficient of 0.7 was used (i.e., relatively impermeable). From this:

$$Q = 0.7 \times [(6.93/1{,}000)/3{,}600] \times 1 = 1.35\times10^{-6}\ m^3/s \text{ per unit area (one } m^2\text{)}.$$

Q was subsequently calculated up based on relative areas to give runoff rates for the various components of the Proposed Development, as presented in **Table 2**.

**Table 2: Calculated Runoff From Access roads and Hardstanding**

| Item | Construction Area ($m^2$) | Runoff Generated ($m^3/s$) - Rounded |
|---|---|---|
| Hardstanding and Crane Pads for Turbines | 90,405 | 0.122 |
| New Access roads | 100,473 | 0.136 |
| Existing Access roads to be Upgraded[1] | 46,883 | 0.063 |
| Construction Compounds[2] | 12,308 | 0.017 |
| Electrical Substation | 21,500 | 0.029 |
| Met Mast Platform | 294 | 0.0004 |
| **Sum** | **271,863** | **0.367** |

Notes:
[1]Existing tracks are c. 4 m wide and require a 2 m upgrade in width. The area shown is for 6 m wide upgraded roads.
[2]Total for 4 no. compounds of equal size.

## 3.3 Sizing of Settlement Ponds

To be able to settle out particles of ten µm, the pond area required is calculated from:

$$Area = Q/Vs$$

Where,

Q = the flow rate into the pond ($m^3/s$).

Vs = settling velocity of particles of 10 µm based on Stoke's Law = 0.000234 m/s.

Results of total pond area requirements for each component of the Proposed Development is presented in **Table 3**.

**Table 3: Calculated Pond Area Requirements To Settle Out 10 µm Particles**

| Item | Runoff Generated ($m^3/s$) - Rounded | Pond Area Required ($m^2$) - Rounded |
|---|---|---|
| Hardstanding and Crane Pads for Turbines | 0.122 | 521.4 |
| New Access roads | 0.136 | 581.2 |
| Existing Access roads to be Upgraded[1] | 0.063 | 269.2 |
| Construction Compounds[2] | 0.017 | 72.6 |
| Electrical Substation | 0.029 | 123.9 |
| Met Mast Platform | 0.0004 | 1.7 |
| **Sum** | **0.367** | **1,570.0** |

There are:

- 21 no. turbines, which means that each turbine site requires a pond of 24.9 $m^2$ on average.
- 4 no. construction compounds of equal size, which means that each compound requires a pond of 18.2 $m^2$.
- The electrical substation and met mast are individual components, requiring the pond areas indicated in **Table 3**, i.e., 123.9 and 1.7 $m^2$, respectively.

- The new and existing access roads require a total pond area of 850.4 $m^2$, across a total length of 22 km, which equates to 38.7 $m^2$ per km length of access roads.

It is envisaged that construction of individual ponds will be limited to areas of 20 to 30 $m^2$ (longer than wider). These are practical dimensions from a constructability of view, using standard equipment, and assume pond depths of <1.5 m.

# 4. References

Marshall, D.C.W. & Bayliss, A.C. 1994. Flood estimation for small catchments, Institute of Hydrology Report No. 124, Institute of Hydrology, Wallingford.

Cawley, A.M., and Cunnane, C. (2003). Comment on Estimation of Greenfield Runoff Rates. Proc. IHP National Hydrology Seminar, Tullamore, Ireland. Accessible from: https://hydrologyireland.ie/wp-content/uploads/2020/12/2-Comment-on-Estimation-of-Greenfield-Runoff-Rates-E_Cawley-Cunnane.pdf

Mulvany, T.J. (1851). On the use of self-registering rain and flood gauges in making observations of the relations of rain fall and of flood discharges in a given catchment. Proceedings of the Institution of Civil Engineers of Ireland 4, 18–33. Reproduced in Loague (2010) Rainfall-Runoff Modelling, Benchmark Papers in Hydrology, IAHS BM4 ISBN 978-1-907161-06-3.

# APPENDIX 9-4

## WATER FRAMEWORK DIRECTIVE ASSESSMENT REPORT

# Appendix 9-4 WFD Compliance Assessment Report

## 1. Introduction

CDM Smith Ireland Ltd (CDM Smith) was requested by MKO, on behalf of Sheskin South Renewables Power Designated Activity Company (DAC), to complete a Water Framework Directive (WFD) Compliance Assessment for the planning application for a proposed wind farm development (Proposed Development) at Sheskin, Co. Mayo.

The Proposed Development comprises 21 no. turbines and grid connection and all associated site development works as set out in Chapter 4 of the Environmental Impact Assessment Report (EIAR).

### 1.1 Purpose of Assessment

The purpose of the assessment is to determine if any specific components or activities associated with the Proposed Development may compromise the WFD status objectives assigned by the Environmental Protection Agency (EPA) for the surface water and groundwater bodies that are associated with Proposed Development area. The assessment supplements Chapter 9 of the EIAR (Hydrology and Hydrogeology) submitted as part of the wind farm planning application.

### 1.2 Statement of Authority

CDM Smith in Ireland is a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors. CDM Smith conducts environmental risk assessments for a large variety of projects, including waste disposal, discharges to waters, flood risk assessment, and water resources management.

This WFD Compliance Assessment was prepared by Henning Moe (registered P. Geo.), a hydrogeologist with over 30 years of practical experience. He was the lead hydrogeologist for the Eastern River Basin District project which was part of Ireland's implementation of the first cycle of the WFD. He has subsequently supported Irish public bodies through the second and third cycles of WFD implementation, including Further Characterisation studies to help select WFD Programmes of Measures, and conducting risk assessments in support of Ireland's WFD reporting to the European Commission. As such, he is experienced with the WFD implementation process, including the details of EPA's water body status requirements and classification tests.

### 1.3 Water Framework Directive

The EU Water Framework Directive (2000/60/EC) is a holistic approach towards water resources management across the EU. The WFD was transposed into Irish law by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD requires that EU Member States achieve WFD 'Good' status objectives for all water bodies by year 2027 at the latest. Where a Member State assigns 'High' status objectives to water bodies, 'High' status must be maintained in 2027.

In Ireland, water body status objectives and water body status are assigned by the EPA in successive 6-year river basin management planning cycles. Status objectives define what must be achieved. Status assignment defines what was achieved. For each successive river basin management plan, EPA determines where objectives have been met and where they have not.

In all water bodies, Programmes of Measures are implemented to protect and/or improve their biological quality elements and environmental supporting conditions. There are two types of measures: Basic Measures, which are statutory and enforceable (e.g., the Sustainable Use of Pesticides regulations); and Supplementary Measures, which are non-statutory and voluntary (e.g., pilot schemes, awareness campaigns).

As part of its WFD implementation, EPA also completes a risk assessment every 6 years, with outcomes that are published in 6-year river basin management plans. Water bodies are either 'At Risk' or 'Not At Risk' of meeting WFD environmental objectives. Where a water body is 'At Risk', EPA determines the 'significant pressures' that places the water body 'At Risk' and which may prevent the water body from meeting its status objective. This determination focuses the Programmes of Measures in that catchment.

Ireland is currently in the third cycle of WFD implementation, which covers the period 2022-2027. Ireland's latest river basin management plan, which was published in 2021, sets out the status objectives to be achieved by year 2027 (DHLGH, 2021). The latest available status classification for all water bodies covers the period 2016-2021.

It is noted that WFD status classification is assessed by EPA and reported formally by Ireland to the European Commission in 6 year river basin management plan cycles. The duration of the construction period for the Proposed Development is approximately 2 years (maximum). Hence, the likelihood of affecting status has a longer-term perspective and is more relevant to the operational phase of the Proposed Development.

The WFD also requires that 'designated sites' (protected areas) meet their environmental requirements and conservation objectives. Designated sites are: Natura 2000 sites (Special Areas of Conservation, SACs, with water-dependent habitats, and Special Protection Areas for species listed in the EU Habitats Directive); drinking water protected areas; bathing waters; shellfish waters; salmonid waters; and nutrient sensitive waters. Environmental requirements and conservation objectives for designated sites are stipulated in existing regulations or are being developed by the relevant public bodies (e.g., National Parks and Wildlife Service for SACs).

# 2. Water Body Identification

This section identifies the surface water and groundwater bodies that can potentially be affected by the Proposed Development.

## 2.6 Surface Water Body Identification

The Proposed Development, including the grid connection route, resides within WFD Catchment 33, Blacksod-Broadhaven, and specifically WFD Subcatchments:

- 33_1, Owenmore(Mayo)_SC_010
- 33_4, Owenmore(Mayo)_SC_020

The Proposed Development is within Sheskin Forest. With reference to **Figure 1**, the WFD reportable river water bodies that flow through the Proposed Development area, including the grid connection route, are:

- Sheskin_Stream_010 (code IE_WE_33S030150)
- Owenmore (Mayo)_040 (code IE_WE_33O040270)

Sheskin_Stream_010 flows into the Owenmore (Mayo)_020 river water body (code IE_WE_33S040200) to the east, in the downstream direction. The local streams that form the Owenmore (Mayo)_040 water body also flow into the Owenmore (Mayo)_020 water body, but do so several kms downstream and approximately 4 km west of Bellacorick.

There are no WFD reportable lake water bodies in the named subcatchments (i.e., no water bodies greater than 50 hectares in size).

## 2.7 Surface Water Body Status Objective

Based on EPA's 'Water' web viewer[5], both the Sheskin_Stream_010 and Owenmore (Mayo)_040 river water bodies, which originate within and flow through the Proposed Development site, are assigned 'High' status objectives. The Owenmore (Mayo)_020 water body is assigned a 'Good' status objective.

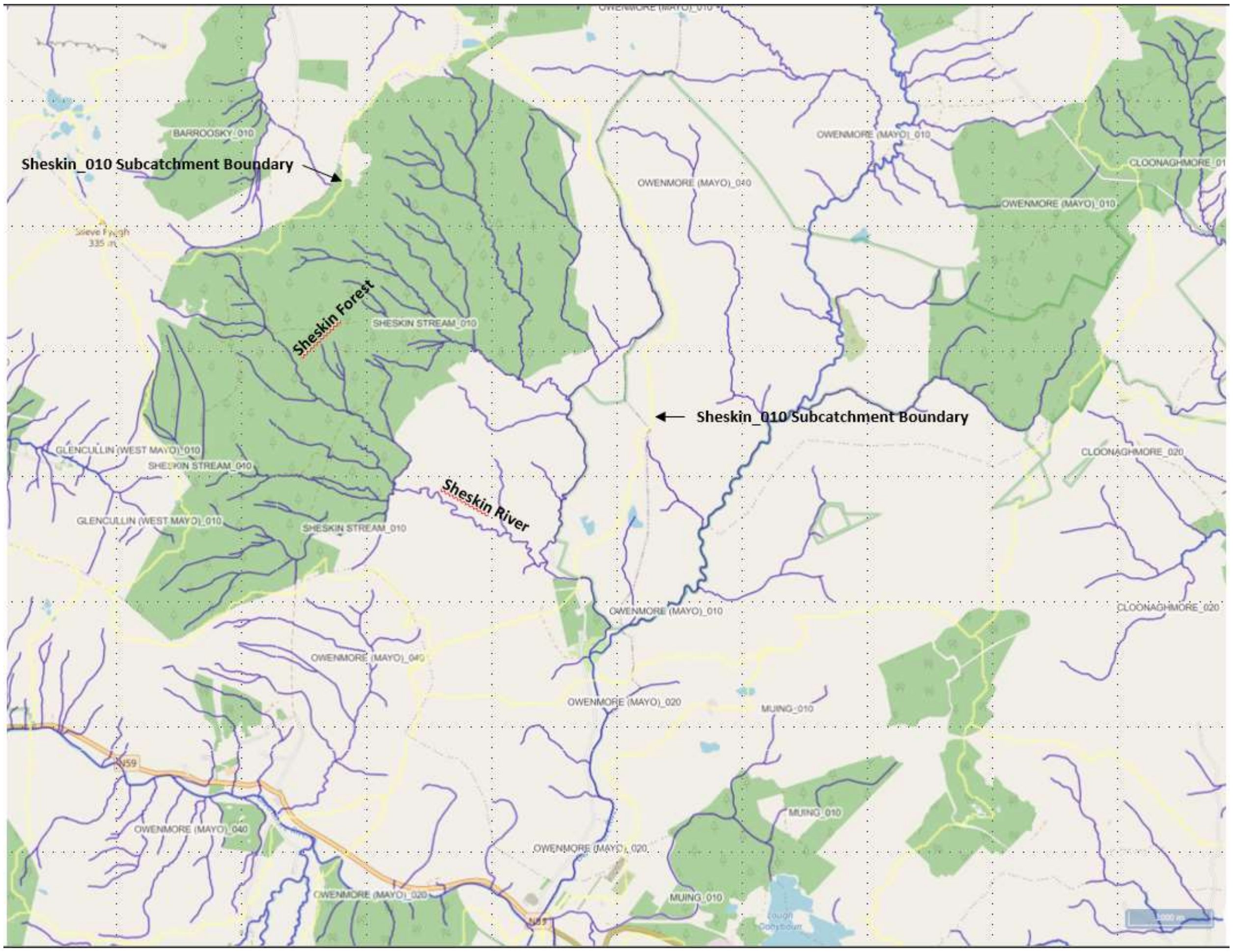


**Figure 1: Surface Water Bodies Within and Downstream of the Sheskin Forest**

The 'High' status objectives of river water bodies within the Proposed Development site reflect the pristine conditions which prevail and that EPA uses for reference purposes to judge status at other locations. Maintaining 'High' status of 'High' status objective water bodies is a WFD priority (DHLHG, 2021).

## 2.8 Surface Water Body Status Classification

Based on the latest available status classification (period 2016-2021)[6], both the Sheskin_Stream_010 and Owenmore (Mayo)_040 river water bodies were assigned 'High' status (indicated by the blue coloured river segments in **Figure 2**), which means WFD status objectives were achieved in the reporting period.

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[5] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 21 February 2023)

[6] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 21 February 2023)

The Owenmore (Mayo)_020 water body was also assigned 'High' status (**Figure 2**), which means it exceeded its 'Good' status objective in the reporting period.

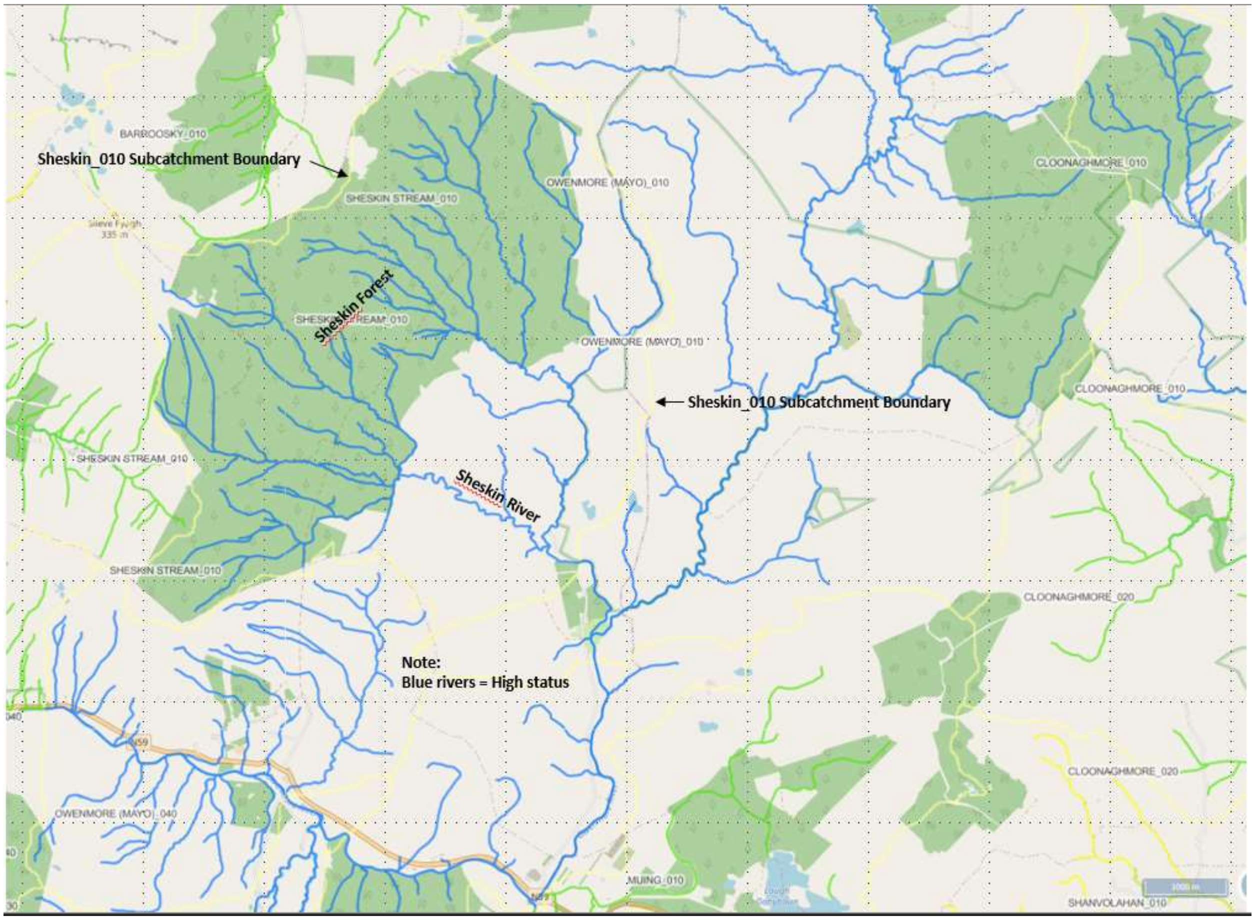


**Figure 2: Surface Water Body Status, 2016-2021**

## 2.9 Surface Water Body Risk Assessment

Based on the latest WFD risk assessment (period 2022-2027)[7], both the Sheskin_Stream_010 and Owenmore (Mayo)_040 river water bodies were classified as being 'Not At Risk' of failing to achieve WFD status objectives in 2027 (indicted by the green coloured river segments in **Figure 3**). The Owenmore (Mayo)_020 water body is also considered to be 'Not At Risk' (**Figure 3**) and no significant pressures have been identified by EPA that would place these water bodies 'At Risk' of failing to achieve WFD status objectives.

[7] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 21 February 2023)

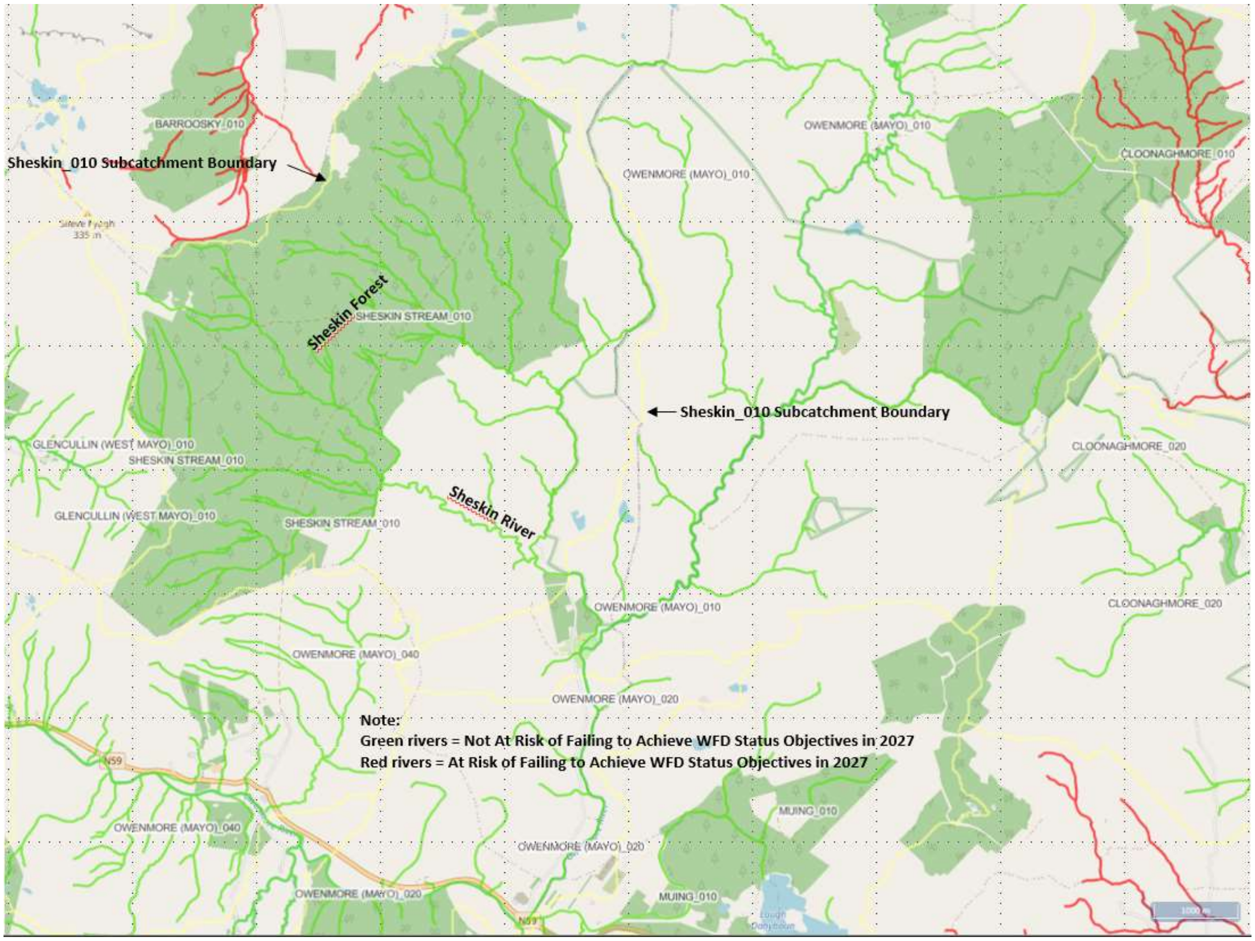


**Figure 3: Surface Water Bodies Within and Downstream of the Sheskin Forest**

## 2.10 Groundwater Body Identification

As documented in Chapter 6 of the EIAR, the Proposed Development site is principally underlain by the Belmullet groundwater body (code IE_WE_G_0057) which comprises bedrock which is classified by the Geological Survey Ireland (GSI) as 'poorly productive'.

The highest elevation, western-most part of Sheskin Forest is underlain by the Bangor groundwater body (code IE_WE_G_0052) which comprises bedrock which is part of a 'locally important' (from a water resources and supply persepctive and is classified by GSI as 'generally moderately productive'.

## 2.11 Groundwater Body Status Classification

There are only two categories of WFD status objectives for groundwater bodies in Ireland – 'Good' and 'Poor'. For the latest status classification period (2016-2021), both groundwater bodies were assigned 'Good' status which means that their WFD status objectives were met in the reporting period.

## 2.12 Groundwater Body Risk Assessment

Both groundwater bodies were also classified as being 'Not At Risk' of failing to achieve WFD status objectives in in year 2027, and significant pressures have been identified by EPA that are impacting on these groundwater bodies.

# 3. WFD Compliance Assessment

## 3.1 Risk Factors - Surface Water

Without mitigation actions, the Proposed Development has the potential to affect the water quality and hydromorphology of streams that flow east from and through the Proposed Development area towards the Owenmore River. Effects can be carried further downstream within the Owenmore River catchment. The main items that can affect water quality and associated aquatic habitats are associated with:

- Physical damage to streambanks and streambeds.
- Sediment load to, and sedimentation of, streambeds.
- Chemical load from drainage of peat, including nutrients (nitrogen and phosphorus) and both suspended organic matter and dissolved organic carbon.
- Contamination events associated with accidental leaks and spills of fuel or other chemicals.
- Changes to natural flow conditions and water quality (e.g., pH) in streams as a result of modifications to the drainage network (NPWS, 2015).

The principal activities that may contribute to effects are:

- During construction - tree-felling, earthworks, drainage/dewatering, culverting, and construction and upgrade of access roads (especially near streams).
- During operations – maintenance works and accidental leaks and spills.
- During decommissioning – same as during construction, but on a smaller scale.

## 3.2 Risk Factors - Groundwater

Without mitigation measures, the Proposed Development can affect groundwater conditions, notably groundwater quality. Items that can result in effects are:

- Contamination events associated with accidental leaks and spills of fuel or other chemicals.
- Changes to shallow groundwater flow patterns in peat and subsoils from the proposed drainage and excavations of borrow pits.

The principal related activities that may contribute to effects are:

- During construction – use of machinery, poor handling of fuels and chemicals, and drainage.
- During operations – maintenance works and accidental spills and leaks.
- During decommissioning – same as during construction, but on a smaller scale.

## 3.3 Risk of Affecting Surface Water Body Status

EPA's status classification scheme for surface water bodies involves the consideration of:

- Biological quality elements of surface water, per the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. 77 of 2019 – e.g., fish, macroinvertebrates. EPA conducts surveys, and the data and findings inform the classification, for example from review of Q-survey data.

- Water quality conditions that support the biological quality elements, per the same regulations. EPA reviews water quality data in context of environmental quality standards (EQS) for 'Good' or 'High' status conditions, as well as data trends and patterns.
- Measurable changes to biological quality elements against established reference conditions that apply for 'Good' and 'High' status.
- Flows and levels of surface waters.
- Visual indicators of impact, such as hydromorphological alterations to streams.
- Research publications and review of other 'best available information', and applying expert judgment.

In the context of the Proposed Development, the current 'High' status conditions would be at risk from longer-term changes to water quality and river morphology, specifically caused by:

- Additional chemical and sediment loading.
- Changes in the pH of streams.

Without mitigation, longer-term effects can result in the deterioration of the current 'High' status. With mitigation (see Section 4 below), the potential for effects is much reduced, especially during the operational phase, as the major earthworks will be completed and permanent drainage controls will be in place. The construction phase is short-term (2 years). The operational phase is 35 years. Maintenance works are still needed, but this is on a much smaller scale compared to construction. The same applies for decommissioning.

Individual, accidental pollution events are unlikely to affect water body status, although serious contamination events (e.g., of hazardous substances) can have longer-term ramifications on aquatic biota.

With regard to nutrients, ammonia and orthophosphate are the principal constituent of concern. The draining of peat can result in leaching of ammonia to water (e.g., Daniels *et al.,* 2012), and the unionized form of ammonia, $NH_3$, can be toxic to fish. However, $NH_3$ (also referred to as 'free ammonia', only forms at pH values that are higher than those that are recorded at the site (Chapter 9 of the EIAR). Orthophosphate is the biologically available form of phosphorus, and is a pollutant that is associated with forestry pressures (in addition to, for example, agriculture).

Since EPA began the national WFD monitoring programme in 2007, water quality data from the Sheskin River downstream of the Proposed Development site boundary at monitoring station RS33S030150 (see Chapter 9 of the EIAR) show total ammonia concentrations ($NH_3$-N) that are mostly below the limits of detection of 0.02 or 0.03 mg/l (in the period of record), with sporadic detection 'spikes' up to 0.05 mg/l.

The average annual EQS for total ammonia is 0.04 mg/l (as N) for WFD 'High' status. Annual average concentrations between 2007 and 2022 are presented in **Figure 4** based on data downloaded from EPA's 'catchments website.[8] The annual average concentrations are below the EQS in all years od record.

The average annual EQS for orthophosphate is 0.025 mg/l (as P) for WFD 'High' status. Average annual concentrations between 2007 and 2022 are presented in **Figure 4** based on the same data source. The average annual concentrations are below the EQS in all years except 2009 when the average annual concentrations equaled the EQS.

[8] https://www.catchments.ie/data/#/waterbody/IE_WE_33S030150?_k=4fpfkl

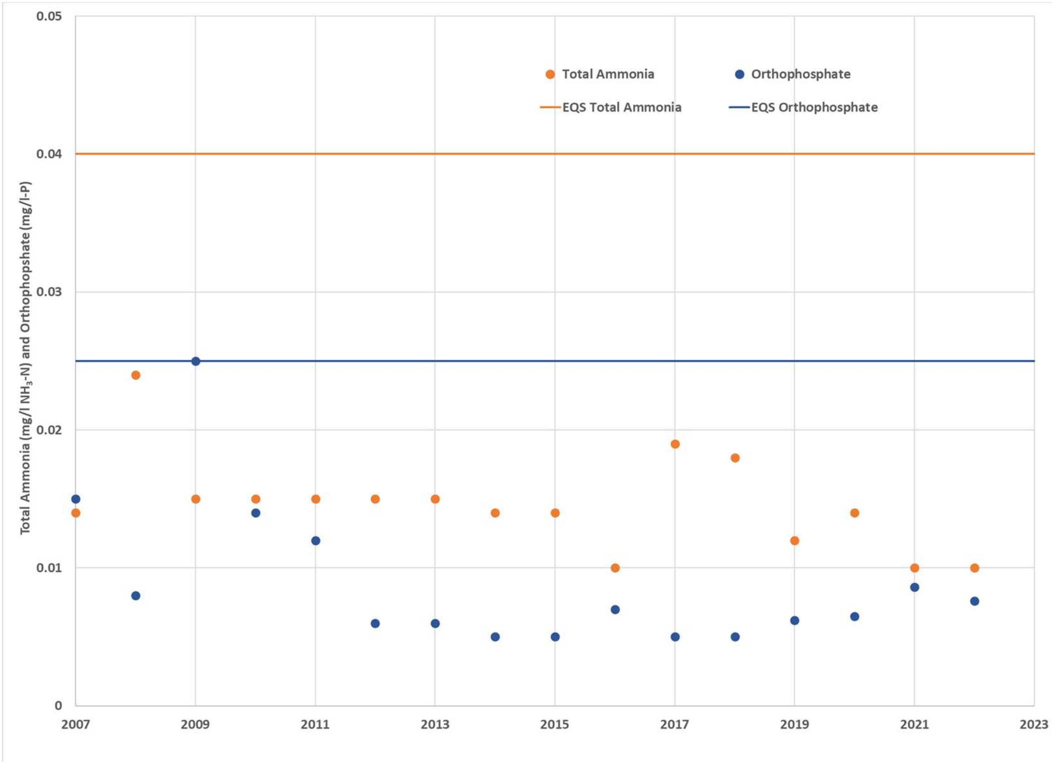


**Figure 4: Annual Average Concentrations of Total Ammonia and Orthophosphate, 2007-2022, EPA Station RS33S030150**

The criteria that can be used to identify and measure potential effects (if any) from the Proposed Development on water status classification are:

- The EQSs which are stipulated in the Surface Water Regulations.
- Observations of river morphological conditions.
- Rapid assessment and small stream impact score surveys, based on established procedures (LAWPRO/EPA, 2022).

A proposed monitoring programme is described in Chapter 9 of the EIAR for all phases of the Proposed Development. Proposed mitigation measures are also summarised in Section 4 below.

## 3.4 Risk of Affecting Groundwater Body Status

When assigning WFD status to groundwater bodies (GWBs), EPA considers:

- 'Quantitative status', which is determined by comparing (known) total abstractions and estimated total recharge volumes across whole GWBs, as well as reviewing trends in groundwater levels a dedicated monitoring well network.
- 'Qualitative status', whereby groundwater quality data from a network of wells and/or springs are compared with 'chemical test' threshold values which are stipulated in the European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2019 (S.I. 366 of 2016). EPA also reviews data trends and patterns to inform technical judgement.

A GWB can be assigned 'Poor' quantitative status but 'Good' qualitative status, or vice versa, and the EPA uses the least favourable outcome to assign final status. A GWB can only be at 'Poor' or 'Good' status overall, and there are no groundwater bodies with 'High' status objectives. 'Good' status is the default status objective for all GWBs.

The Proposed Development does not include any large or longer-term groundwater abstractions. There will be a need for temporary sump pumping during construction of foundations and the Borrow Pits, but the volumes are expected to be small and manageable. The pumping duration is also brief, and the temporary effect will be imperceptible in context of the overall water balance of Belmullet GWB.

Accordingly, the Proposed Development will not affect the WFD quantitative status classification of either the Belmullet (or Bangor) GWB.

Groundwater quality in the bedrock aquifers is relevant because groundwater provides limited baseflow to the streams within the Proposed Development site, especially during prolonged dry weather, low-flow conditions (see Chapter 9 of the EAIR). Groundwater is also part of the environmental supporting conditions of the peat.

There are no activities planned with the Proposed Development that will influence the groundwater quality in the bedrock aquifers in the long-term. Accidental spills and leaks can occur, which can affect groundwater quality locally, but these would likely be brief/episodic. Individual spill and short-term pollution events during construction are unlikely to affect GWB status. A localised groundwater quality issue within the Proposed Development site would not influence the determination of status for the whole groundwater body.

Accordingly, the Proposed Development will not affect the WFD qualitative status of either the Belmullet or Bangor GWBs.

# 4. Mitigation to Prevent Status Deterioration

In order to mitigate against potential negative effects on surface water and/or groundwater quality, as well as flow volumes and patterns, mitigation measures will be implemented during all phases of the Proposed Development. Proposed measures are outlined below, as derived from Chapter 9 of the EIAR.

## 4.1 Construction Phase – Drainage and Earthworks

Examples of proposed measures during the construction phase are summarised in **Table 1**. Water quality protection incorporates sequential barriers of protection within the proposed drainage management system.

**Table 1: Examples of Mitigation Measures During Construction Phase**

| Mitigation Type | Description |
|---|---|
| Avoidance Controls | ▪ 50m buffer zones to natural watercourses.<br>▪ Working in appropriate weather and suspending certain work activities in advance of or when periods of heavy rainfall occur. |
| Source Controls | ▪ Upslope interceptor drains and downslope swales, diversion drains, culvert pipes. |
| | ▪ Designated works areas and minimizing footprints<br>▪ Covering stockpiles and promoting vegetation growth. |
| In-line Controls | ▪ Erosion and velocity control measures such as sandbags, silt fences, check dams, oyster bags filled with gravel, filter fabrics, straw bales, weirs or baffles; and/or other similar/equivalent or appropriate systems.<br>▪ Collection sumps, temporary sumps, pumping systems.<br>▪ Sediment traps, attenuation ponds. |
| Treatment Controls | ▪ Settlement ponds |

| Mitigation Type | Description |
|---|---|
| | ▪ Sediment traps<br>▪ Silt fences, filter fabrics, silt bags, sumps |
| Discharge/Outfall Controls | ▪ Level-spreaders to generate diffuse low-energy discharges<br>▪ Buffered outfalls to break energy of discharges and reduce soil erosion.<br>▪ Vegetation filters.<br>▪ Weirs to help control discharges. |
| Accidental spills and leaks | ▪ Construction and environmental management plan.<br>▪ Surface water management plan<br>▪ Visual inspections and monitoring |

## 4.2 Operational Phase

Mitigation measures during the operational phase involve applying best practice methods for maintenance of the drainage management system and roads, and avoiding accidental spills and leaks.

Maintenance of interceptor drains and settlement (stilling) ponds is especially important during operations to sustain their functionality, as they serve to buffer runoff during periods of high rainfall, by retaining water until the storm has receded and reducing the hydraulic and sediment loading to water courses. Settlement ponds have been designed in consideration of greenfield runoff rates and 6-hour duration, 1 in 10 year storm events.

## 4.3 Decommissioning Phase

Potential effects during decommissioning are similar to those associated with construction, but the magnitude of activity is much reduced. It will also be possible to reverse or at least reduce any potential effects caused during construction, and to a lesser extent operation, by rehabilitating constructed areas such as turbine bases and hard standing areas. This will be done by covering with vegetation to encourage vegetation growth, which will reduce runoff and sediment transport.

The wind farm site roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised by forestry works and other participating landowners.

The underground cables connecting the site infrastructure to the onsite substation will be removed, while the ducting itself will remain in-situ, as this is considered to have less of a potential environmental impact in terms of earthworks and, therefore, the possibility of mobilizing suspended sediments to/in watercourses.

The turbines will be removed and transported offsite along their original delivery route. The disassembly and removal of the turbines will not have an impact on the hydrological/hydrogeological environment at the wind farm site.

Other effects such as potential contamination by fuel leaks will remain, but this will be of reduced magnitude.

## 4.4 All Phases – General Items

Other aspects of potential surface water and groundwater quality impacts will be mitigated by best practice methods as set out below, with an emphasis on mitigation by avoidance. These apply to all phases of the Proposed Development.

### Accidental Spills and Leaks of Fuel and Chemicals

- Onsite refueling of machinery will be conducted using a mobile double skinned fuel bowser.
- Onsite refueling will be conducted by trained personnel only.

- The fuel bowser, a double-axel, custom-built, refueling trailer will be refilled offsite, and will be towed around the site by a 4x4 vehicle to where machinery is located.
- The 4x4 vehicle will carry fuel absorbent material and pads in the event of any accidental spillages.
- The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
- Mobile measures such as drip trays and fuel absorbent mats will be used during all refueling operations.
- A permit to fuel system will be put in place.
- Taps, nozzles or valves associated with refueling equipment will be fitted with locks.
- Refueling will not be permitted within the 50 m buffer zone of streams.
- All fuel storage areas will be bunded appropriately for the duration of the construction phase.
- All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area.
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage.
- The electrical control building (at the substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater (or surface water). The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor.
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management Plan.

### Wastewater:

During the construction phase, self-contained port-a-loos with integrated waste holding tanks will be used at each of the construction compounds, maintained by the providing contractor, and removed from site on completion of the construction works. No wastewater will be discharged onsite.

During the operational phase, wastewater from staff welfare facilities in the control buildings will be managed by means of a sealed storage tank. Wastewater generated will be removed by permitted waste collectors for offsite disposal at wastewater treatment plants. No wastewater will be discharged onsite.

### Cement-based compounds:

- No batching of wet-concrete products will occur onsite. Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will be relied on, also for culverts.
- Where concrete is delivered onsite, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of concrete contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds.
- Weather forecasting will be used to avoid pouring concrete on days of heavy rainfall.
- Pour sites will be kept free of standing water and plastic covers will be ready in case of sudden rainfall events.

## 4.4 Residual Effects After Implementing Mitigation Measures

With the implementation of the mitigation measures outlined above, no likely significant effects on surface water or groundwater receptors will occur. As a result, risks are managed and the current (2016-2021) WFD status classification of named water bodies will be maintained.

# 5. Designated Sites

As presented in Chapters 6 and 9 of the EIAR, the Proposed Development site directly borders three SACs:

- Slieve Fyagh Bog SAC to the west. The headwaters of Sheskin River are partly within and receives runoff from the SAC.
- Carrowmore Lake Complex SAC to the west and south, which is in a different subcatchment from Sheskin River but is part of the headwaters of the local streams that for the Owenmore(Mayo)_040 water body (relevant to the grid connection route).
- Glenamoy Bog Complex SAC to the northwest, which is also in a different subcatchment from Sheskin River.

Each of the SACs have blanket bog among their qualifying interests, along with other specific habitats and species (see Chapter 6 of the EIAR for details). The SACs are part of the same upland bog system that is present within the Proposed Development site. For this reason, further consideration was given to the potential effects of the Proposed Development on each SAC.

In the context WFD compliance, direct effects on the conservation objectives of the SACs will not occur since the Proposed Development is not directly within the SACs. However, indirect effects can potentially occur, which is considered below.

## 5.1 Draining of Peat

The shallow interceptor drains that are planned upslope of infrastructure components, including access roads, are designed to capture greenfield runoff. Establishing new drains involves excavation works. When saturated peat is cut, drainage of peat will occur. This causes lowering of water levels in the upslope direction. The hydraulic effect can propagate upslope with time, and this distance will be a function of the properties of the peat, the prevailing climatic conditions, and potential hydraulic interaction with other (existing) drains in the system. This described in greater detail in Chapter 9 of the EIAR.

If the hydraulic effect extends to the SACs, the peat in the SACs could become partially drained. The relevant question becomes – will the SACs become hydraulically affected by the Proposed Development?

There is no simple rule of thumb that can be applied to estimate how far the hydraulic effect may extend. This is because bog science is location-specific and bog hydrology is both dynamic and transient, responding to changes in event-based, seasonal, and longer-term climatic conditions. Potential effects at distance will also take time to be established and is considered more relevant for the operational phase (35 years) than the construction phase (2 years).

In the UK and Irish scientific literature, there are empirically based examples of drainage effects (see Chapter 9 of the EIAR for details). For the upland bog setting at Sheskin, and from a weight-of-evidence approach, a distance of 100 m is considered reasonable and pragmatic as a criterion to consider potential effects.

The nearest distances from respective SAC boundaries to planned drainage features in Sheskin Forest are:

- Slieve Fyagh Bog SAC – 230m (access track to turbine T5 and met mast).

- The Carrowmore Lake Complex SAC – 25m (hardstanding for turbine T2).
- The Glenamoy Bog Complex SAC – 195m (access track to turbine T12).

The areas where planned infrastructure is within or approaches the 100 m distance criterion in the upslope direction are:

- Turbines T2 and T17 in the southwestern portion of the site (Carrowmore Lake SAC)
- Turbines T3 and T5/met mast (Slieve Fyagh Bog SAC)
- Turbine T12 (Glenamoy Bog Complex SAC).

As presented in Chapter 9 of the EIAR, assuming that the hydraulic effect translates 100 m into a SAC, the maximum estimated area that would be hydraulically influenced by turbines T2 and T17 is 5 hectares, or 0.14% of the total SAC area. This also assumes that the effect will translate across a topographic divide.

Although effects along SAC boundaries can theoretically add up, the probability of hydraulic effects extending into SACs is low. This is because the majority of drainage is at distance of 250 m or more from the SAC boundaries and the bog system is rainfall-dependent in a wet, upland setting with high and frequent rainfall. The Sheskin Forest is also already extensively drained by the forestry operation. For these reasons, no likely significant effects on the SACs from drainage are expected.

## 5.2 Surface Water Quality Impairment

Any surface water quality impairment associated with the Proposed Development will be transmitted in downstream directions. Without mitigation measures, the planned activities in Sheskin Forest can affect local streams and the Sheskin and Owenmore Rivers. Activities along the grid connection route can also affect the small tributaries that discharge south to Owenmore River (west of Bellacorick).

Near its confluence with Sheskin River and north of Bellacorick, the Owenmore River borders the Bellacorick Bog Complex SAC. Hence, the Proposed Development is hydrologically, albeit indirectly, linked to the Bellacorick Bog Complex SAC. However, a potential effect on the SAC is considered highly unlikely. This is because the SAC is on the eastern flood plain of Owenmore River and the SAC is dependent on environmental supporting conditions (including surface water and groundwater inflows) from the east (within the SAC).

The Owenmore River also borders the Bellacorick Bog Complex SAC at Bellacorick by the N59 junction, but this time south of the river. This portion of the SAC receives inflows from the south and the SAC at this location is considered to be outside of any possible influence of Sheskin River or the local streams that flow past the grid connection route.

By extension, the Owenmore River also borders the Owenduff/Nephin Complex SAC/SPA further downstream, more than 5 kms west of Bellacorick. The SAC/SPA also drains from the south, and for the same reason, the SAC/SPA is considered to be outside of any possible influence of Sheskin River or the local streams that flow past the grid connection route.

With regard to the grid connection route, this follows an existing roadway south from Sheshkin Forest. It passes the eastern boundary of the Carrowmore Lake Complex SAC but neither the roadway nor the grid connection crosses the SAC.

Several small tributaries drain south from the Carrowmore Lake Complex SAC to the Owenmore River (approximately 4 km downstream from Bellacorick). The tributaries are part of the Owenmore (Mayo)_040 water body.

As described in Chapters 4 and 9 of the EIAR, the construction of the grid connection route involves earthworks (trenching, ducting and filling) and stream crossings using existing bridges and trenchless technology (horizontal drilling). The SAC is hydrologically upstream of the route, and for this reason, there will be no deterioration of water quality or WFD status of water bodies within the SAC.

The Slieve Fyagh Bog SAC and Glenamoy Bog Complex SAC referred to in Section 5.1 are in separate subcatchments from the Proposed Development. For this reason, there will be no deterioration of water quality or WFD status of water bodies within the SAC.

# 6. Summary

The Proposed Development site is located within the subcatchment of Sheskin River which has a 'High" status objective assigned by EPA. The Proposed Development is, therefore, within a priority subcatchment for protection.

For the latest available WFD status classification period (2016-2021), all water bodies (surface water and groundwater) that are associated with the Proposed Development site met their WFD status objectives.

Deterioration of WFD status is not permitted by the WFD and Irish Law. The Proposed Development has the potential to cause deterioration of status for surface water bodies. For this reason, mitigation measures are necessary and proposed to break potential source-receptor linkages and provide for attenuation of suspended sediments especially. The means and methods of achieving the necessary levels of protection are proven and established based on existing guidance and practical experiences from other similar development. The proposed mitigation measures will be strictly enforced.

All measures are incorporated into the CEMP, which the Contractor will be legally required to adhere to. Extensive monitoring will be practiced, according to the surface water management plan presented in Appendix 4-4 and as proposed in Chapter 9 of the EIAR, in order to be able to track water quality and identify any potential effects.

With the proposed mitigation measures, the Proposed Development is will not cause a deterioration in the WFD status of water bodies within or downgradient of the site. Potential significant effects on adjoining SACs are also unlikely which means the Proposed Development will not cause deterioration of water quality or WFD status of water bodies within SACs.

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