Planning and Environmental Consultants

Natura Impact Statement

Umma More Renewable Energy Development

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Planning and Environmental Consultants

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1. INTRODUCTION

1.1 Background

MKO has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment of the proposed renewable energy development which will comprise 9 No. wind turbines, and associated infrastructure in the townland of Umma More, and adjacent townlands, in Co. Westmeath (the Wind Farm Site), and a 110kV on-site substation and associated works, including 110kV underground electrical cabling connection to the national grid at Thornsberry 110kV substation, in the townland of Derrynagall or Ballydaly, near Tullamore, Co. Offaly (Grid Connection). Refer to Section 3 of this NIS for a detailed description of the Proposed Development (Wind Farm Site & Grid Connection).

An Appropriate Assessment Screening Report has been prepared and is provided as Appendix 1 of this Natura Impact Statement (NIS). The Appropriate Assessment Screening Report has identified the European Sites upon which the Proposed Development has the potential to result in likely significant effects and the pathways by which those effects may occur. It has also identified those qualifying interests/special conservation interests that have the potential to be affected by the Proposed Development. Those sites will be assessed in this NIS.

This Natura Impact Statement (NIS) 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 Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010) and the Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin 7, Ireland OPR (2021).

This report has been prepared in compliance with Part XAB of the Planning and Development Act 2000 (as amended), the Planning and Development Regulations 2001(as amended) and relevant jurisprudence of the European and Irish courts. It has also been prepared taking consideration of the following guidance:

1. *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, 2001)*
2. *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*
3. *Department of the Environment (December 2009, amended 11 February 2010) Guidance on the Appropriate Assessment of Plans and Projects in Ireland.*
4. *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.*
5. *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,*
6. *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.*
7. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*

8. *CIEEM (2018) Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment.*
9. *EC (2021) Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC*

The purpose of the NIS is to provide an examination, analysis and evaluation of the potential impacts of the Proposed Development on European Sites and to present findings and conclusions with respect to the Proposed Development in light of the best scientific knowledge in the field. This NIS will inform and assist the competent authority, in carrying out its Appropriate Assessment, as to whether or not the Proposed Development will adversely affect the integrity of European Sites, either alone or in combination with other plans and projects, taking account of their conservation objectives.

It is the view of the authors of this NIS that following the implementation of mitigation measures described in Section 6.3 that the Proposed Development will not, by itself or in combination with other plans or projects, have any adverse effect on the integrity of any European sites in view of their conservation objectives and there is no reasonable scientific doubt as to that conclusion.

1.1.1 References to Proposed Development

For the purposes of this NIS:

- Where the 'Proposed Development' is referred to, this relates to all the project components comprising the Wind Farm Site and Grid Connection as detailed in Section 3 of this NIS.
- Where 'the Site' is referred to, this relates to the primary study area for the NIS, as delineated by the Site Boundary in green as shown on Figure 3-1.
- Where the 'Wind Farm Site' is referred to, this refers to turbines and associated foundations and hard-standing areas, meteorological mast, junction accommodation works, access roads, temporary construction compound, underground cabling, spoil management, site drainage, tree felling and all ancillary works and apparatus. The planning application for the Wind Farm Site is made to An Bord Pleanála in accordance with the provisions of Section 37E of the Planning and Development Act 2000, as amended.
- Where 'Grid Connection' is referred to, this refers to the temporary construction compound and 110kV onsite substation, and associated underground 110kV electrical cabling connecting to the existing Thornsberry 110kV substation, subject to a future planning application under Section 182A of the Planning and Development Act, 2000, as amended.

This NIS, along with an Environmental Impact Assessment Report ('EIAR'), will accompany the planning permission application for the Wind Farm Site which will be made to An Bord Pleanála in accordance with the provisions of 37E of the Planning and Development Act 2000, as amended. Both the NIS and EIAR contain the information necessary for An Bord Pleanála to complete the Appropriate Assessment and Environmental Impact Assessment as required for this planning permission application. The Grid Connection is an integral part of the Proposed Development and is assessed in this NIS, however, it will be subject to a separate planning permission application. The planning permission application for the Grid Connection will be made to An Bord Pleanála in accordance with the provisions of 182A of the Planning and Development Act 2000, as amended.

Both the NIS and EIAR take into account the combined impacts of these individual elements of the Proposed Development.

For clarity, in this NIS, all elements of the Proposed Development will be assessed cumulatively and in combination with other plans and projects to aid the competent authority in carrying out an AA.

1.2 Statement of Authority

The baseline ecological surveys were undertaken by Patrick Ellison (BSc., MSc., ACIEEM), Cathal Bergin (BSc), Rudraksh Gupta (BSc., MSc), Laura McEntagart (BSc.), Laoise Chambers (BSc.) Cora Twomey (BSc) and Brónagh Boylan (BSc.) of MKO. All surveyors have relevant academic qualifications and experience in undertaking habitat and ecological assessments and are competent experts for the purposes of carrying out the field the surveys and assessments that they were required to do.

Dedicated bird surveys of the site of the Proposed Development (see Section 2.2) and the surrounding area (see Section 2.2.2.1) were undertaken between March 2019 and April 2021, and an ornithological assessment has been carried out by Donnacha Woods (MSc.), Project Ornithologist of MKO and reviewed by Susan Doyle (MSc.), Senior Ornithologist. Both are suitably qualified ecologists with experience in completing avifaunal assessments and competent. The scope of works and survey methodology was devised by Padraig Cregg (MSc.) and is fully compliant with recent NatureScot (formerly Scottish Natural Heritage) guidance. Field surveys were undertaken by Peter Capsey (BA), John Curtin (BSc.), Niamh Graham, Patrick Manley (BSc.), Eric Dempsey, Jack Kennedy (BSc.), Pádraig Webb (BSc.), Kristina O'Connor (BSc., MSc.) and Tom Ryan (BSc.). Surveyors are suitably qualified for the purposes of the preparation of this NIS.

Incidental faunal sightings/signs were also recorded during bird surveys of the site and have also been included to inform this assessment.

This report has been prepared by Cora Twomey and Patrick Ellison (B.Sc., M.Sc., ACIEEM). Cora had relevant academic qualifications and over 6 months' experience in professional ecological consultancy experience. Patrick has over 6 years' professional experience in ecological consultancy, management and assessment. This report has been reviewed by John Hynes (B.Sc., M.Sc., MCIEEM). John is a highly experienced ecologist who has over 10 years' professional experience in environmental management and ecological assessment.

1.3 Structure and Format of this NIS

- Section 2 sets out the scope of the NIS by firstly providing a summary of the findings of the Article 6(3) Appropriate Assessment Screening Report. This clearly identifies the European Sites that have the potential to be significantly affected by the Proposed Development and the pathways by which they might be affected. Section Two then identifies the individual Qualifying Interests (QIs) or Special Conservation Interests (SCIs) that have the potential to be affected via the identified pathways for effect.
- Following this, in Section Three, all elements of the proposed project are fully described.
- Section 4 describes the baseline environment with respect to the relevant QI/SCI of the screened in European Sites.
- Section 5 provides an assessment of the potential for adverse effects on the identified European Sites in the absence of mitigation.
- Section 6 provides an assessment of potential impacts and outlines mitigation to robustly block any identified pathways for impact.
- Section 7 provides an assessment of residual effects taking into consideration the proposed mitigation.
- In Section 8, the potential in combination effects of the Proposed Development on European Sites, when considered in combination with other plans and projects were assessed.
- A concluding statement is provided in Section 9.

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

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

- Lough Ree SAC [000440]
- River Shannon Callows SAC [000216]
- Lough Ree SPA [004064]
- Middle Shannon Callows SPA [004096]

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

The Appropriate Assessment (AA) Screening Report identified and considered all SACs and SPAs within the potential likely zone of impact of the Wind Farm Site, as well as considering European Sites within the vicinity of the Grid Connection. Potential for connectivity with European Sites from the Proposed Development was considered in this Stage 1 Screening Assessment. Potential hydrological connectivity from the Wind Farm Site and along the Grid Connection (particularly the underground electrical cabling route) to any downstream designated sites was assessed, and where connectivity was identified these designated sites were also considered to be within the potential likely zone of impact.

The location of European Sites within the vicinity of the Proposed Development site is provided as Figure 2-1.

In the absence of any specific European or Irish guidance in relation to SPAs, NatureScot (formerly SNH) Guidance (SNH, 2016) was consulted. This provides guidance in relation to the identification of ecological connectivity between the Proposed Development site and Special Protection Areas. The guidance is also relevant to Ireland for species that are also present in Ireland. The distances for core and maximum dispersal and foraging ranges are drawn from a literature review that examined ranging behaviour across a variety of locations in Britain, Ireland and beyond, not just in Scotland (Pendlebury et al. 2011). The guidance takes into consideration the distances species may travel beyond the boundary of relevant SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects. It goes on to state that "in most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying Interests". Where SPAs are at greater distance from the Proposed Development than the core foraging distances for their listed SCI species, there is no likely ecological connectivity to the Proposed Development and so the SPAs are outside the likely Zone of Impact. The only rare exception is where there is a lack of suitable foraging sites near an SPA, prompting an SCI species to travel further. This situation is not considered applicable for the suite of SPAs considered in this document, as they either provide suitable foraging habitat for their SCI species within the relevant SPAs or suitable foraging habitat is widely available within the immediately surrounding area.

According to the NatureScot guidance, the core foraging distances of wintering grey geese (greylag goose and pink-footed goose) from SPAs is 15-20 km. This represents the largest foraging range of all the species listed in this guidance document. It is acknowledged that information on core foraging ranges is not available for all SCI species. In such cases, the 15-20 km core foraging range for grey geese has been adopted as a precautionary approach.

It is noted that wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for the SPAs listed above (if located within the core foraging range of the SCI species). If wetland habitats within such sites were affected by the Proposed Development this could therefore indirectly affect SCI bird species for the relevant SPAs. Potential hydrological or hydrogeological effects have therefore been considered for SACs and other wetland sites that could potentially support SCI bird species for the relevant SPAs.

Lough Ree SAC
Lough Ree SAC
Lough Ree SPA
Lough Ree SAC
Ballymore Fen SAC
Lough Owel SPA
Lough Owel SAC
Woo
Lough Ennell SAC
Lough Ennell SPA
Carn Park Bog SAC
Crosswood Bog SAC
Middle Shannon Callows SPA
Split Hills and Long Hill Esker SAC
iddle Shannon Callows SPA
ver Shannon Callows SAC
Pilgrim's Road Esker SAC
Mongan Bog SAC
Mongan Bog SPA
Fin Lough (Offaly) SAC
Clara Bog SAC
Raheenmore Bog SAC
Ferbane Bog SAC
Moyclare Bog SAC
Charleville Wood SAC
on Callows SPA

Map Legend

- EIAR Site Boundary -
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- WFD Catchments
- WFD Subcatchments
- WFD River Waterbodies

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Drawing Title
European Sites within the Potential Likley Zone of Influence

Project Title
Umma More Renewable Energy Development

Drawn By	Checked By
PE	JH
Project No.	Drawing No.
123456	Figure 2-1
Scale	Date
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3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Site Location

The Wind Farm Site is located approximately 2 kilometres southwest of Ballymore, Co. Westmeath, 6.6 kilometres to the north of Moate, Co Westmeath and 12.2 kilometres northeast of Athlone, Co. Westmeath. It is proposed to access the Wind Farm Site via an existing access track off the L5363 Local road to the northwest of the site. The Wind Farm Site is served by a number of existing agricultural roads and tracks.

The Grid Connection includes for a 110kV on-site substation and temporary construction compound, and underground 110kV electrical cabling from the proposed onsite 110kV substation within the Wind Farm Site to the existing Thornsberry 110kV substation in the townland of Derrynagall or Ballydaly, County Offaly. The underground electrical cabling route, measuring approximately 31 km in length, is primarily located within the public road corridor.

Current land-use on the Wind Farm Site comprises coniferous forestry, and agriculture. Current land-use along the Grid Connection comprises of public road corridor, public open space, discontinuous urban fabric and agriculture. Land-use in the wider landscape of the Site comprises a mix of agriculture, peat cutting, quarrying, low density residential and commercial forestry.

The site location map is shown in Figure 3-1

3.2 Characteristics of the Proposed Development

This section of the NIS describes the Proposed Development and all its component parts. Consultation with An Bord Pleanála confirmed that the Proposed Development will be subject to a dual consenting process, with development relating to the Grid Connection subject to a separate planning application under Section 182A of the Planning and Development Act, 2000, as amended. The current planning application, relating to the Wind Farm Site, is being made to An Bord Pleanála under Section 37E of the Planning and Development Act, 2000, as amended.

The development description for the current planning application as appears in the public notices is as follows:

The Proposed Development will consist of the provision of the following:

i. *9 No. wind turbines with an overall ground-to-blade tip height of 185 metres; a rotor blade diameter of 162 metres; and hub height of 104 metres, and associated foundations and hard-standing areas;*
ii. *A thirty-year operational life from the date of full commissioning of the wind farm and subsequent decommissioning;*
iii. *A meteorological mast with a height of 30 metres, and associated foundation and hard-standing area;*
iv. *Junction accommodation works and temporary access roads to facilitate turbine delivery to an existing entrance on L5363.*
v. *Upgrade of existing entrance on L5363 for provision of site entrance;*
vi. *Upgrade of existing tracks/ roads and provision of new site access roads, junctions and hardstand areas;*
vii. *Underground electrical (33kV) and communications cabling;*
viii. *A temporary construction compound;*
ix. *Spoil Management;*

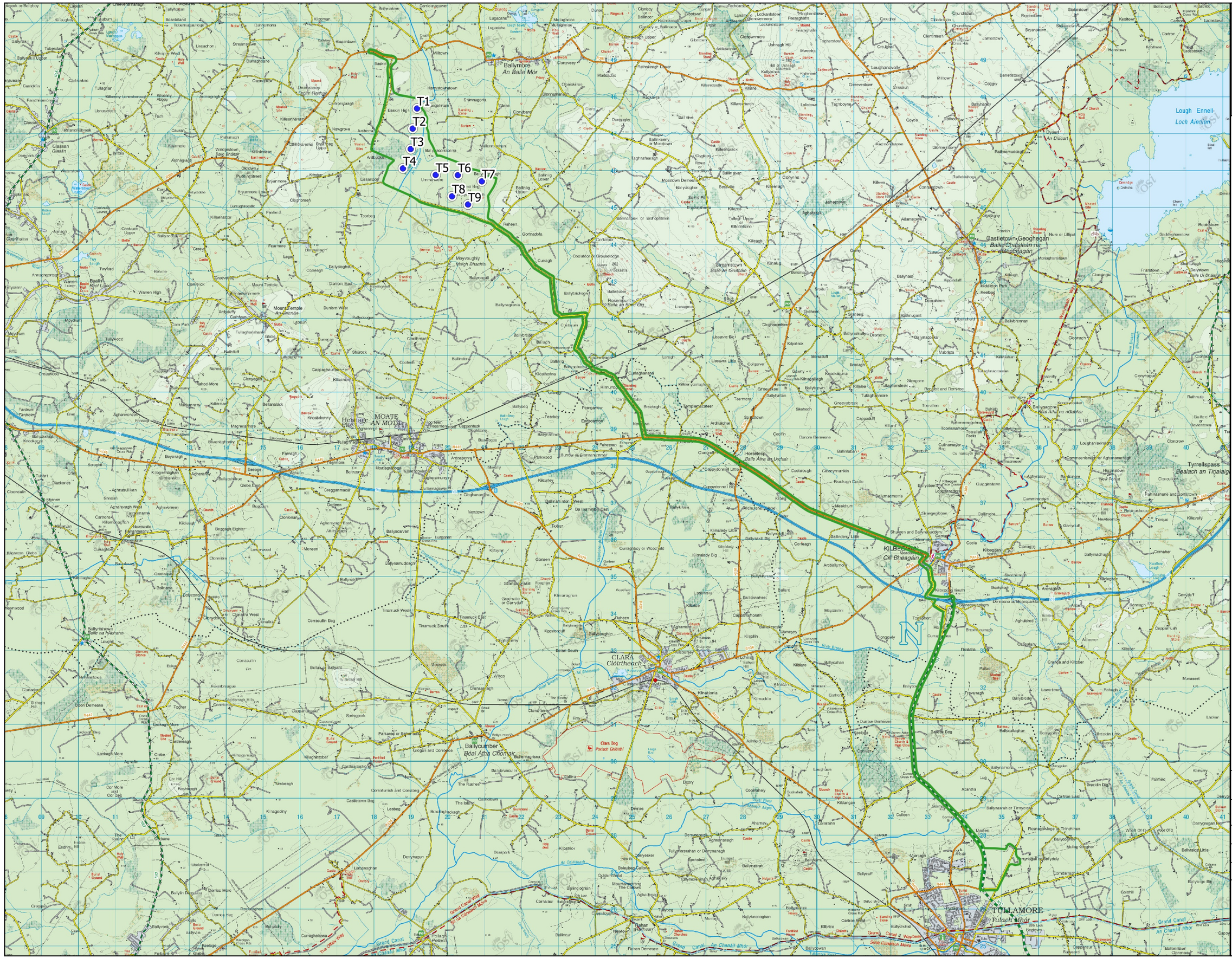
x. *Site Drainage;*
xi. *Tree Felling;*
xii. *Operational stage site signage; and*
xiii. *All ancillary works and apparatus.*

The application is seeking a ten-year planning permission.

The Grid Connection, which will be subject to a separate planning application, includes for a 110kV on-site substation compound (2 no. control buildings with welfare facilities, all associated electrical plant and apparatus, security fencing, underground cabling, waste water holding tank, site drainage and all ancillary works), a temporary construction compound and approximately 31km of underground 110kV electrical cabling connecting the proposed on-site substation to the existing Thornsberry 110kV substation, near Tullamore, Co. Offaly.

All elements of the Proposed Development, i.e. the Wind Farm Site and Grid Connection, have been assessed in relation to European Sites as part of this NIS.

Detailed site layout drawings of the Wind Farm Site are included in Appendix 6 and the Grid Connection Infrastructure is inlcuded in Appendix 7 to this NIS.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

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Drawing Title: Proposed Developement Site Boundary

Project Title: Umma More Renewable Energy Development

Drawn By	Checked By
PE	JH
Project No.	Drawing No.
201050	Figure 3-1
Scale: 1:90000	Date: 2023-01-20

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1:2500 scale of Turbine, Hardstand and Foundation

1:2500 scale of Met Mast Location

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Turbine Hardstands
- Proposed Turbine Foundation
- Proposed Met Mast Location
- Proposed New Roads
- Proposed Upgrades to Existing Roads
- Temporary Construction Compound
- Grid Connection - Subject to a Separate Application

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Drawing Title

Wind Farm Site Layout

Project Title

Umma More Renewable Energy Development

Drawn By	Checked By
BT	EC
Project No.	Drawing No.
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Scale	Date
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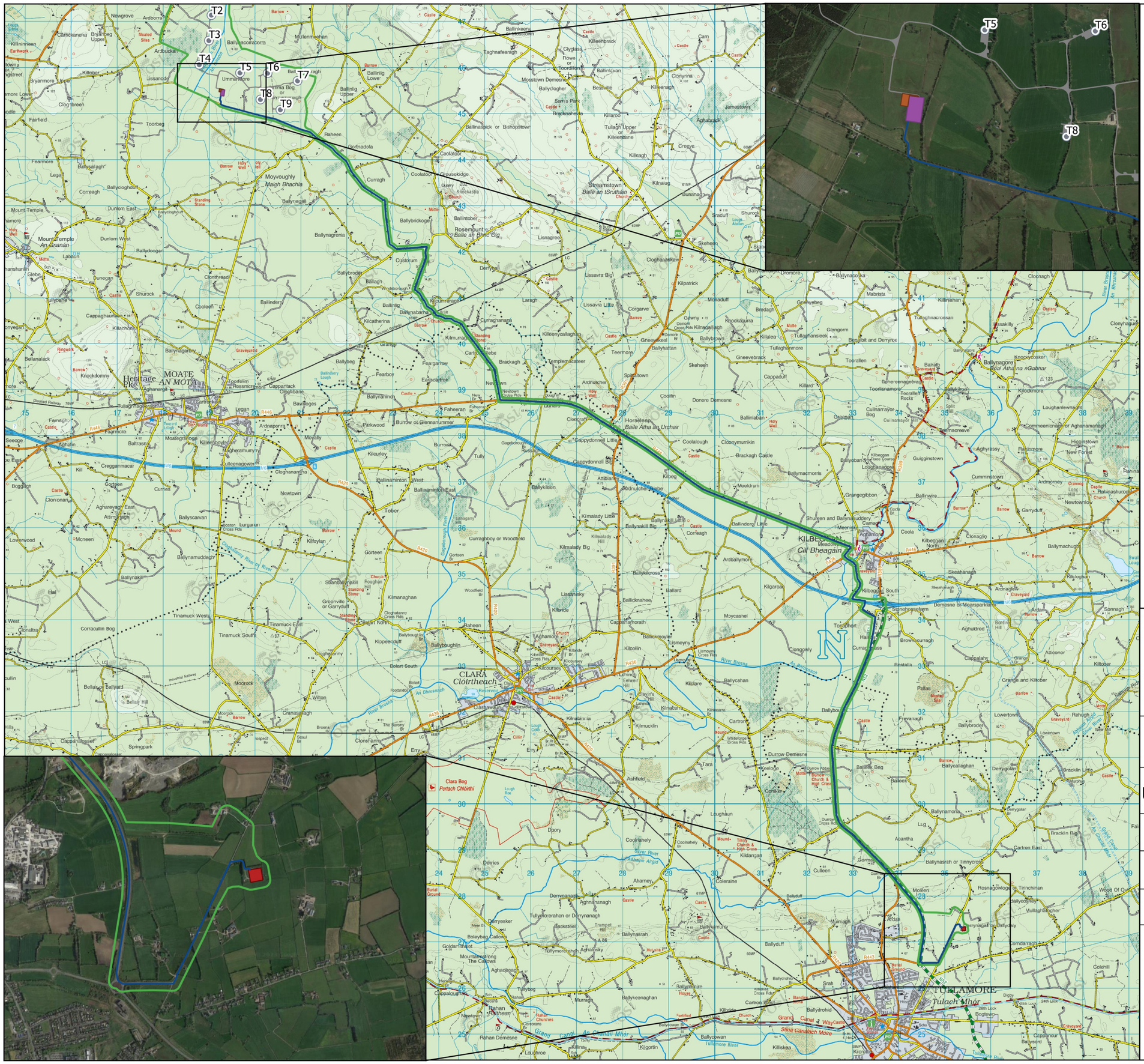

Map Legend

- EIAR Site Boundary
- Proposed 110kV Onsite Substation
- Proposed Temporary Construction Compound
- Proposed Underground Electrical Cabling Route
- Existing Thornsberry 110kV Substation
- Wind Farm Site Infrastructure - Subject to Separate Application

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Drawing Title

Grid Connection Layout

Project Title

Umma More Renewable Energy Development

Drawn By	Checked By
NMcH	EC
Project No.	**Drawing No.**
201050	Figure 3-3
Scale	**Date**
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3.2.1 Wind Farm Site – Development Components

3.2.1.1 Wind Turbines

The proposed wind turbine layout has been optimised using wind farm design software (WindPro) to maximise the energy yield from the Wind Farm Site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. The Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below. The final ground level of the turbine foundations will be determined by the actual ground conditions at each proposed turbine location and may differ slightly from those levels listed in Table 4-1. Also, in accordance with the '*Wind Energy Development Guidelines for Planning Authorities'* (Department of the Environment, Heritage and Local Government (DOEHLG), 2006) micro-siting of the turbine positions may be required within the criteria set out in the guidelines.

Table 3-1 Proposed Wind Turbine Locations and Elevations

Turbine	ITM Coordinates		Top of Foundation Elevation (m OD)
	Easting	Northing	
T1	619119	747703	56m
T2	619001	747158	56m
T3	618946	746605	56m
T4	618737	746080	56m
T5	619623	745904	58m
T6	620224	745898	60m
T7	620874	745730	58m
T8	620067	745325	69m
T9	620500	745103	70m

3.2.1.1.1 *Turbine Type*

Wind turbines use the energy from the wind to generate electricity. A wind turbine, as shown in Plate 4-1 below, consists of four main components:

Foundation unit
Tower
Nacelle (turbine housing)
Rotor

Plate 3-1 Wind turbine components

The turbine model to be installed on the Wind Farm Site will have an overall ground-to-blade tip height of 185 metres; blade rotor diameter of 162 metres and hub height of 104 metres. Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the Wind Farm Site will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times.

For the purposes of the NIS, the above turbine dimensions have been selected and considered in the relevant sections of the NIS. Turbine design parameters have a bearing on the assessment of ecology (specifically birds), as addressed within this NIS.

It should also be noted that the assessment of the development footprint of the Wind Farm Site, within the NIS is based on the maximum potential footprint for all of the infrastructural elements. This precautionary approach is taken as the assessment of the maximum development footprint will, in the absence of mitigation measures, give rise to the greatest potential for significant effects. Should the development footprint be less than the maximum, the potential for significant effects will also be reduced.

3.2.1.1.2 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 turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. The maximum horizontal and vertical extent of the turbine foundation will be 25m and 4m respectively.

After the foundation level of each turbine has been formed using piling methods or on competent strata (i.e bedrock or subsoil of sufficient load bearing capacity), the "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 demountable formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 3-2 below).

Plate 3-2: Turbine 'Anchor Cage' and finished turbine base

3.2.1.1.3 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place. All crane hardstand areas 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 35m x 75m. The sizes, arrangement and positioning of hard standing areas are dictated by turbine suppliers. The proposed hard standing areas are illustrated in the detailed drawings included in Appendix 6 of this NIS. The extent of the required areas at each turbine location may be optimised on-site depending on topography, position of the Wind Farm Site access road, the proposed turbine position and the turbine supplier's exact requirements.

3.2.1.1.4 Assembly Area

Levelled assembly areas will be located on either side of the hard-standing area as shown on Figure 4-4. These assembly areas are required for offloading turbine blades, tower sections and hub from trucks until such time as they are ready to be lifted into position by cranes and to assist the main crane during turbine assembly. The extent of the area required for the assembly areas is shown on the detailed drawing in Appendix 6.

3.2.1.2 Site Roads

3.2.1.2.1 *Road Construction Types*

To provide access within the Wind Farm Site and to connect the wind turbines and associated, infrastructure, existing roads and tracks will need to be upgraded and new access roads will need to be constructed. The road construction design has taken into account the following key factors:

1. *Buildability considerations;*
2. *Making use of existing infrastructure where possible;*
3. *Minimising excavation arisings;*
4. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;*

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.

The Wind Farm Site makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 1.1 kilometres of existing site roads and tracks, and to construct approximately 7.4 kilometres of new access road on the Wind Farm Site. It is proposed to construct passing bays along the proposed access road network.

Upgrade of Existing Access Roads or Tracks

The existing tracks onsite were constructed using the excavate and replace construction technique. The general construction methodology for upgrading of existing sections of excavated roads or tracks is summarised below.

1. *Access road construction shall be to the alignment illustrated on the planning application drawings.*
2. *Excavation will be required on one or both sides of the existing access track to a competent stratum.*
3. *Granular fill to be placed in layers in accordance with the designer's specification.*
4. *The surface of the existing access track will be overlaid with up to 300mm of selected granular fill.*
5. *Access roads to be finished with a layer of capping material across the full width of the road.*
6. *A layer of geogrid/geotextile may be required at the surface of the existing access road in areas of excessive rutting (to be confirmed by onsite engineer).*
7. *For excavations in spoil, side slopes shall be not greater than 1 (v): 2. This slope inclination will be reviewed during construction, as appropriate.*
8. *The finished road width will be approximately 5m, with localised widening at bends and changes in direction.*
9. *The passing bays will be approximately 5m in width and 40m in length where it meets the road network, tapering to 18m in length at the furthest point from the road.*
10. *On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.*
11. *A final surface layer shall be placed over the existing access track, as per design requirements, to provide a suitable road profile and graded to accommodate wind turbine construction and delivery traffic.*

Construction of New Excavated Roads

Due to the ground conditions, new access tracks proposed on the Wind Farm Site are proposed to be founded on competent stratum. The typical make-up of the founded access tracks will be a stone thickness of 500mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed by the Site Engineer.

The general construction methodology for construction of excavated roads is summarised below.

1. *Excavation will take place to a competent stratum beneath the topsoil (as agreed with the site designer and resident engineer).*
2. *Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road to be excavated without re-placement with stone fill.*
3. *The surface of the excavated access roads will be overlaid with approximately 500mm of selected granular fill. Granular fill to be placed in layers in accordance with the designer's specification.*
4. *Access roads to be finished with a layer of capping material across the full width of the road.*
5. *A layer of geogrid/geotextile may be required at the surface of the competent stratum.*

Construction of New Excavated Roads in Site-Specific Flood Modelled Zone

There is 110 metres of proposed access road within site-specific flood modelled 100-yr and 1000-yr zone within the Wind Farm Site. The new access tracks proposed on the Wind Farm Site are proposed to be founded on competent stratum and the track surface will be built up by at least 500mm above the flood modelled elevation of both the 100-yr and 1000-yr site-specific modelled flood events. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed by the Site Engineer.

The general construction methodology for construction of excavated roads is summarised below.

1. *Excavation will take place to a competent stratum beneath the topsoil (as agreed with the site designer and resident engineer).*
2. *Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road to be excavated without re-placement with stone fill.*
3. *The surface of the excavated access roads will be overlaid with approximately 500mm of selected granular fill which will be at least 500mm above the modelled 100-yr and 100-yr flood elevation (100-yr event - 55.86 mOD, 1000-yr event - 56 mOD).*
4. *There is an existing field drain which will be culverted under the proposed access track. This culvert will provide a drainage outlet for flood water following a significant flood event. This will prevent any damming effect from the proposed access road within this section.*
5. *Granular fill to be placed in layers in accordance with the designer's specification.*
6. *Access roads to be finished with a layer of capping material across the full width of the road.*
7. *A layer of geogrid/geotextile may be required at the surface of the competent stratum.*

3.2.1.3 Site Underground Electrical (33kV) and Communications Cabling

Each turbine will be connected to the on-site electricity substation via underground 33 kV (kilovolt) electricity cabling. Fibre-optic cables will also connect each wind turbine and the met mast to the onsite substation. The electricity and fibre-optic cabling connecting to the onsite substation compound will be run in cable ducts approximately 1.2 metres beneath ground level, along the sides of roadways or under the roadways. The route of the cable ducts will follow the access track to each turbine location

and are illustrated on the site layout drawings included as Appendix 6 of this NIS, the exact number and configuration of cable ducting may vary within the cabling trench. Figure 3-4 below shows two variations of a typical cable trench, one for off-road trenches and one for on-road trenches. The cabling may be placed on either side of the roads, on both sides of the road or within the road. The exact configuration of the underground cabling will be set by the requirements of the electrical designers at detailed design stage.

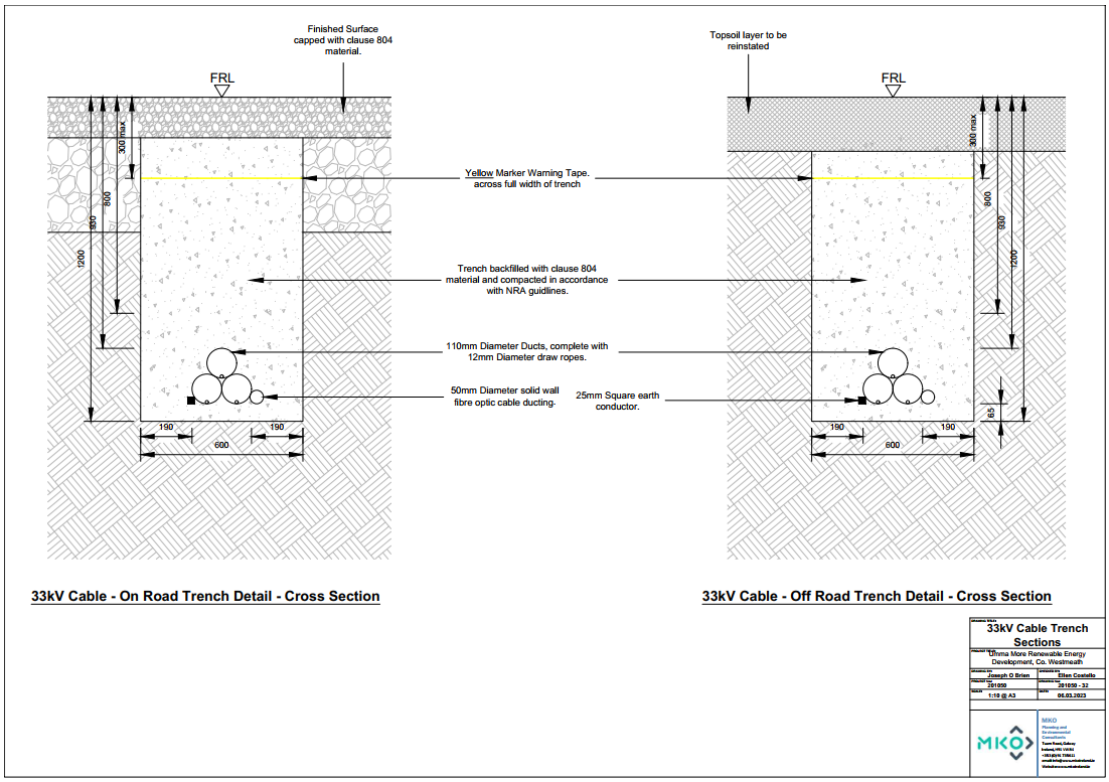

Figure 3-4: Cable trench cross section detail

Clay plugs (water flow barrier) 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. Backfill material will be compacted in layers with approved engineer's specified material, which may be imported onto the Wind Farm Site should sufficient volumes of suitable material not be encountered during the excavation phase of the proposed infrastructure.

3.2.1.4 Meteorological Mast

One metrological (met) mast is proposed as part of the Wind Farm Site. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast will be located at E618790, N746386 (ITM) as shown on the Wind Farm Site layout drawings in Appendix 7. The mast will be a free-standing slender lattice structure 30 metres in height. The mast will be constructed on a hard-standing area sufficiently large to accommodate the equipment that will be used to erect the mast.

3.2.1.5 Temporary Construction Compound

A temporary construction compound measuring approximately 4,250 square metres in area will be located in the northern section of the Wind Farm Site, adjacent to the proposed new road junction at Turbine No. 1. The location and layout of the proposed construction compound is shown on the Wind Farm Site layout drawing in Figure 3-2.

The construction compound will consist of a bunded refuelling and containment area for the storage of lubricants, oils and site generators etc, and full retention oil interceptor, waste storage area, temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. There will also be a water supply on site for hygiene purposes, by way of a temporary storage tank.

Construction materials and turbine components will be brought directly to the proposed turbine locations following their delivery to the Wind Farm Site.

3.2.1.6 Tree Felling and Replanting

3.2.1.6.1 *Tree Felling*

As part of the Proposed Development, tree felling will be required within and around development footprint to allow for the construction of the turbine bases, access roads, underground cabling, and the other ancillary infrastructure.

A small section of the Wind Farm Site is located on commercial forestry, namely Turbine no. 4 and its associated infrastructure. A total of 6.4 hectares of commercial forestry will be permanently felled within and around Turbine No. 4 and its associated infrastructure, along with existing treeline boundaries.

The commercial forestry 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 licence cannot be applied for until such time as planning permission is obtained for the Proposed Development.

3.2.1.6.2 *Forestry Replanting*

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites. The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the infrastructure developments.

The estimated 6.4 hectares that will be permanently felled for the footprint of the Proposed Development infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will 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 replacement of the 6.4 hectares of forestry can occur anywhere in the State subject to licence. 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[1] 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. Before the Minister can grant approval, he/she must first assess if the development, individually or in combination with other plans or projects is likely to have a significant effect on a European site (for Habitats purposes).

[1] *All proposed forestry developments where the area involved is greater than 0.1 hectare must receive the prior written approval of the Forest Service. The application for approval is known as Pre-Planting Approval – Form 1.*

3.2.2 Grid Connection – Development Components

3.2.2.1 Onsite 110 kV Substation

It is proposed to construct a 110 kV electricity substation within the Wind Farm Site, as shown in Figure 3-3. The proposed onsite 110kV substation is located within agricultural land and will be accessed via the internal Wind Farm Site proposed road network.

The footprint of the proposed onsite 110kV substation compound measures approximately 11,100 square metres in area, and will include 2 no. control buildings and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine, and export that electricity from the onsite 110kV substation to the national grid. The layouts and elevations of the proposed onsite 110kV substation are shown in Appendix 6. The construction and exact layout of electrical equipment in the onsite 110kV substation will be to EirGrid / ESB Networks specifications.

The onsite 110kV substation compound will include steel palisade fencing (approximately 2.4 metre high or as otherwise required by ESB), and internal fences will also segregate different areas within the main substation.

3.2.2.2 Substation Control Buildings

Two 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 northern 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.

The control buildings will include staff welfare facilities for the staff that will work on the Proposed Development during the operational phase of the project. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the Proposed Development there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the buildings or, alternatively, install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, *Guide for Drilling Wells for Private Water Supplies* (IGI, 2007). The well will be 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.

It is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control buildings will be managed by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.

Such a proposal for managing the wastewater arising on site has become almost standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system 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 Wind Farm 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 Wind Farm Site.

3.2.2.3 Temporary Construction Compound

A temporary construction compound measuring approximately 3,150 square metres in area will be located in the southern section of the Wind Farm Site, located adjacent to the western boundary of proposed onsite substation. This construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. There will also be a water supply on site for hygiene purposes, by way of a temporary storage tank. The location of the proposed construction compound is shown on the Grid Connection Infrastructure drawings provided in Appendix 7.

3.2.2.4 Underground Electrical Cabling Route

It is proposed to construct an onsite 110 kV substation within the Wind Farm Site and to connect from here via a 110 kV underground electrical cable connection to the existing 110 kV Thornsberry substation in near Tullamore, Co. Offaly. The underground electrical cabling route originates at the proposed onsite 110kV substation within the Wind Farm Site and before reaching the 110kV Thornsberry substation and is shown in Appendix 7 to this NIS. The underground electrical cabling route is approximately 31km in length and is located primarily within the public road corridor, with a short section of underground cabling (approximately 0.2km) within an agricultural field within the Wind Farm Site.

The underground electrical cabling route will originate at the proposed onsite substation and run south for 0.2km within an agricultural field within the Wind Farm Site before meeting the local public road L5336 in the townland of Umma More. The underground electrical cabling route will continue south-west along local roads for approx. 10.4km before joining the R446, in the townland of Newtown. The underground electrical cabling route will continue east along the R446 for approx. 8.4km and continues south onto the R436 at the western boundary of the town of Kilbeggan, in the townland of Kilbeggan. The underground electrical cabling route will continue south along the R436 for 0.2km before continuing east on to the L5213 local road in a residential housing estate (Meadow Park, Co. Westmeath) in the townland of Meadowpark for approx. 0.1km before reaching the River Brosna. As detailed in Section 3.2.6.7.4 below, the cable ducts for the underground electrical cabling route will be installed under this watercourse via directional drilling (DD). This crossing methodology for the River Brosna (identified as Grid Connection underground electrical cabling trench watercourse crossing no. 7) will ensure that no contact will be made with the watercourse during the works. Once the River Brosna is crossed, the underground electrical cabling route will continue east into a residential housing estate (Brosna Park, Co. Westmeath) along the L52084 and L52085 in the townland of Kilbeggan for 0.2 km. The underground electrical cabling route will continue south along the L5208 for 0.8km before reaching a footpath that runs adjacent to the M6 motorway in the townland of Kilbeggan and Kilbeggan South. The underground electrical cabling route will continue under the M6 via a footpath that joins local roads north and south of the M6 for approx. 0.4km, the underground electrical cabling route will continue along the local road for 1km before continuing onto the N52 in the townland of Hallsfarm. The underground electrical cabling route will continue south along the N52 for approx. 7.9km until it meets the Ardan roundabout at Tullamore. The underground electrical cabling route meets the local road off the roundabout and will continue along the local roads for approx. 1.4km before entering the 110kV Thornsberry substation property and connecting into the substation compound.

3.2.3 Spoil Management Plan

3.2.3.1 Quantities

The quantity of spoil, requiring management on the site of the Proposed Development has been calculated, as presented in Table 3-2 below.

Table 3-2: Spoil Volumes requiring management

Development Component	Area (m2) (approx.)	Spoil Volume(m3) (approx.)
Wind Farm Site		
9 no. Turbines and Hardstanding Areas	32,150	50,400
Access Roads	61,250	24,500
Meteorological Mast	375	150
Temporary Construction Compound	4,250	1,700
Total		76,750
Grid Connection		
Onsite Substation	12,000	12,000
Temporary Construction Compound	3,150	1,300
Cabling Trench	18,600	22,320
Total		35,620
Total Spoil to be managed		112,370

Note: A contingency factor of 10%) has been applied and is included to the excavated spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.

Tree felling is proposed at various locations across the Site; however this will not involve the excavation of tree stumps and as such does not affect the excavation volumes. Where tree stumps are removed along proposed access roads, the excavation volume has been included in the above table.

3.2.3.2 Spoil Management Areas and Placement of Spoil Alongside Access Roads

It is proposed to manage any excess overburden generated through construction activities locally within the Wind Farm Site, in identified spoil management areas and in linear berms along access roads where

appropriate. The total capacity of the spoil management areas within the Wind Farm Site is 127,500m^3, providing enough capacity for the total volume of spoil requiring management for the Proposed Development as detailed in Table 3-2 above.

The spoil management areas and placement of spoil alongside access roads have been selected based on the locations of spoil generation, areas suitable for spoil management and environmentally constrained areas such as identified site-specific flood modelled zones as detailed in Chapter 9: Water of the EIAR (included as Appendix 2 of this NIS).

The following recommendations/best practice guidelines for the placement of spoil in identified spoil management areas and alongside access roads will be adhered to during the construction of the Proposed Development:

1. Placement of spoil alongside access roads will consist of a 3m wide berm on either side of the road as appropriate. Spoil placement alongside access roads will take place outside of watercourse buffers and of the site-specific flood modelled zone within the Wind Farm Site (a 110m section of access road) as detailed in Section 9.3.5 in Chapter 9 of the EIAR (included as Appendix 2 of this NIS).
2. At the identified spoil management areas, the vegetative top-soil layer will be removed to allow for spoil to be placed and upon reaching the recommended height, the vegetative topsoil layer will be reinstated.
3. The identified spoil management areas will be developed in a phased approach, with the topsoil removed and temporarily stockpiled within the defined area while the spoil it being placed. The stockpiled topsoil will then be reinstated over the placed spoil, and the exercise will continue within the same spoil management area until the area is full.
4. In the case of T04 where spoil management areas will be within areas of felled forestry, no topsoil will be excavated. The tree stumps will be left in-situ and the spoil will be placed on top of the existing ground and finished with a layer of topsoil from within the site.
5. The placement of spoil will be restricted to a maximum height of 1.0m, subject to confirmation by the Geotechnical Engineer.
6. Where practical, it will be ensured that the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.
7. Finished/shaped side slopes of the placed spoil will be not greater than 1 (v): 2 (h) in the dedicated spoil management zones and not greater than 1 (v): 1 (h) alongside access tracks.
8. Inspections of the spoil management areas will be made by a geotechnical engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil management areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated.
9. An interceptor drain will be installed upslope of the identified spoil management areas to divert any surface water away from these areas.
10. Silt fences and double silt-fences will be emplaced down-gradient of spoil management areas and will remain in place throughout the entire construction phase, or until reseeding has been established to a sufficient level.
11. The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the Project Ecologist.
12. All the above-mentioned general guidelines and requirements will be confirmed by the Geotechnical Engineer prior to construction.

As detailed above in Table 3-2, the spoil volume requiring management for the Grid Connection underground electrical cabling route has been taken account in the total spoil volume requiring management for the Proposed Development. As detailed above, there is capacity for the total volume

of spoil requiring management for the Proposed Development in the spoil management areas within the Wind Farm Site. However, some of the Grid Connection underground electrical cabling route materials will go to an appropriate licenced facility as required. This is dependent on the road makeup at locations along the underground electrical cabling route and the distance from the underground electrical cabling route to the Wind Farm Site, the main contractor will determine the appropriate location for management of arisings from the Grid Connection underground electrical cabling route.

3.2.4 Site Activities

3.2.4.1 Environmental Management

All proposed activities on the site of the Proposed Development will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Development and is included in Appendix 3 of this NIS.

The CEMP includes details of drainage, spoil management and waste management, and outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to comply with the environmental commitments outlined in this NIS. In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for approval.

Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site in appropriately bunded containers.

On-site refuelling of machinery will be carried out at dedicated refuelling locations using a mobile double skinned fuel bowser. The fuel bowser, a double-axle custom-built refuelling trailer will be re-filled off site and will be towed around the Wind Farm 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 compound when not in use.

Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays, spill kits and fuel absorbent mats will be available if necessary, during all refuelling operations.

3.2.4.2 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks.

The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to Site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the Site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plate 3-3 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 will be 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.

Plate 3-3: Concrete washout area

Alternatively, a Siltbuster-type concrete wash unit or equivalent (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) may be used. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Wind Farm Site roads will initially be constructed with a subgrade and compacted with the use of a roller to allow concrete delivery trucks access all areas where the concrete will be needed. The final wearing course for the Wind Farm Site roads will not be provided until all bases have been poured. No concrete will be transported around the Site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed.
- The arrangements for concrete deliveries to the Site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site 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.

3.2.4.3 Concrete Pouring

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine. The main pours will be planned days or weeks in advance.

Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These may include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) or equivalent.
- Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.

3.2.4.4 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling/settlement ponds in the Wind Farm Site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and temporary construction compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

3.2.4.5 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. It is not anticipated that vehicle or wheel washing facilities will be required as part of the construction phase of the Proposed Development because site roads will be formed before road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

A road sweeper will be available if any section of the public roads requires cleaning due to construction traffic associated with the Proposed Development.

3.2.4.6 Waste Management

The CEMP, Appendix 3 of this NIS, provides a waste management plan (WMP) which outlines the best practice procedures during the construction phase of the Proposed Development. The WMP outlines 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 a last resort.

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity must have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the Proposed Development to ensure that all contractors hired to remove waste from the Site have valid Waste Collection Permits 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.

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.

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.

3.2.5 Site Drainage

The drainage design for the Proposed Development has been prepared by Hydro Environmental Services Ltd. (HES). The drainage design has been prepared based on experience of the project team of other wind farm sites, and the number of best practice guidance documents referred to in the Bibliography section of Appendix 2 to this NIS.

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 around the existing natural drainage features have been used to inform the layout of the Proposed Development.

3.2.5.1 Existing Drainage Features

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. It is proposed that 1 no. new watercourse crossing will be required to facilitate the renewable energy development infrastructure.

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 have to 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 Wind Farm 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.

3.2.5.2 Drainage Design Principles

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Development are as follows:

- Keep clean water clean by intercepting it where possible, upgradient of works areas, and divert it around the works areas for discharge as diffuse overland flow or for rewetting of land.
- Collect potentially silt-laden runoff from works areas via downgradient collector drains and manage via series of avoidance, source, in-line, treatment and outfall controls prior to controlled diffuse release as overland flow or for rewetting of land.
- No direct hydraulic connectivity from construction areas to watercourses, or drains connecting to watercourses.
- Where possible, maintain 50-metre watercourse buffer zones for the wind turbines.
- No alteration of natural watercourses.
- Maintain the existing hydrology of the Site.
- Blocking of existing manmade drainage as appropriate.
- Daily inspection and recording of surface water management system by on-site clerk of works and immediate remedial measures to be carried out as required and works temporarily ceased if a retained stormwater/sediment load is identified to have the potential to migrate from the Site.
- Use of siltbuster if required.

Drainage water from any works areas of the site of the Proposed Development will not be directed to any natural watercourses within the Site. Two distinct methods will be employed to manage drainage water within the Site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the Site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the proposed drainage design is presented in Figure 3-5 below.

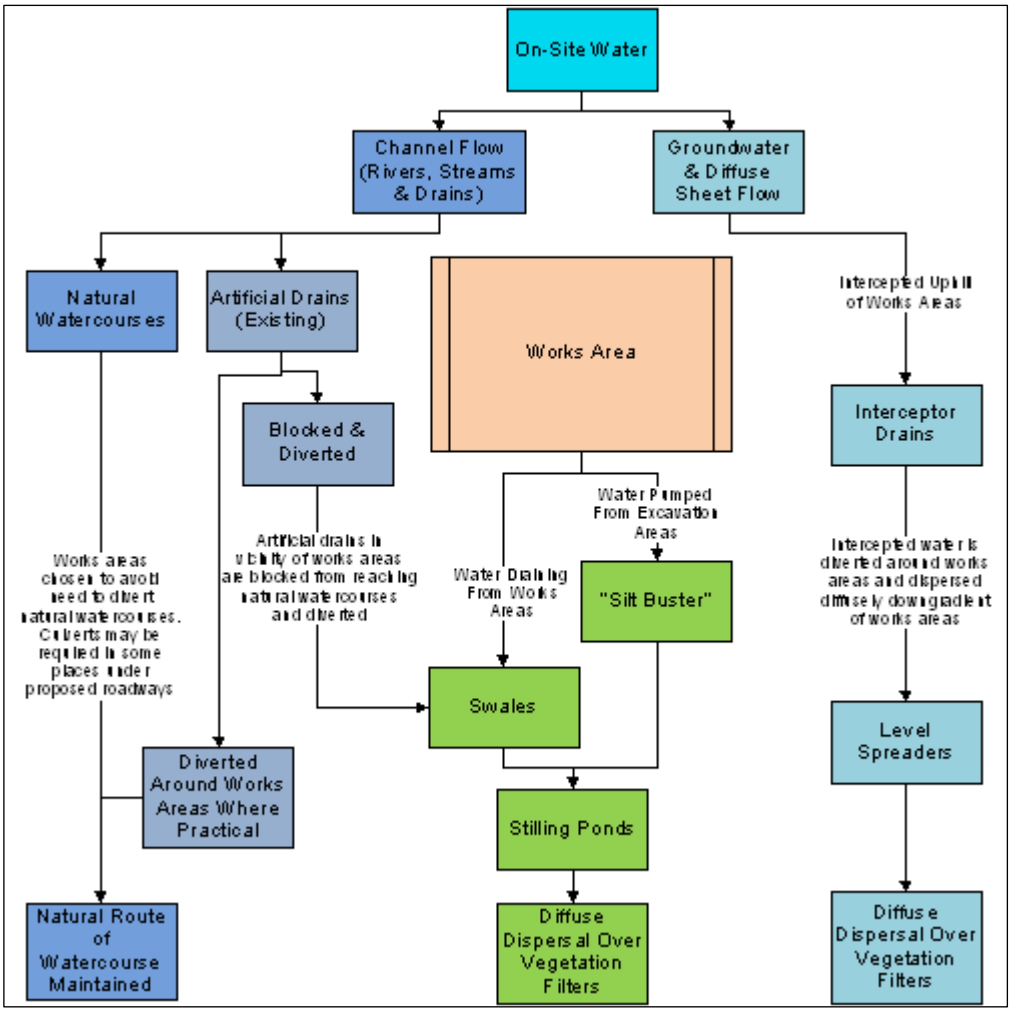

Figure 3-5: Proposed Development Drainage Process Flow

3.2.5.3 Drainage Design

A drainage design for the Proposed Development, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 4 to this NIS. The drainage design employs the various measures further described below and is cognisant of the following guidance documents:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Services (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;
- COFORD (2004): Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- 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); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

3.2.5.3.1 *Interceptor Drains*

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the Site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed Site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting of conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains would be maintained in localised areas along the roadway with culverts under the roadway, which would allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains and culverts may be left in situ following construction.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.6.4.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 4.6.4.4 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

3.2.5.3.2 *Swales*

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the Site during the construction phase. Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Development during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above.

Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the Site and prevent it reaching natural watercourses.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

3.2.5.3.3 *Check Dams*

The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive.

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing artificial drainage channels on the Site, downstream of where drainage swales connect in.

The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

3.2.5.3.4 *Level Spreaders*

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.

The water carried in interceptor drains will not have come in contact with works areas of the Site, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 3.2.5.3.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

3.2.5.3.5 *Piped Slope Drains*

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length.

Piped slope drains will only remain in place for the duration of the construction phase of the Proposed Development. on completion of the works, the pipes and rock aprons will be removed and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

3.2.5.3.6 *Vegetation Filters*

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through stilling ponds prior to diffuse discharge to the vegetation filters via a level spreader.

3.2.5.3.7 *Stilling Ponds (Settlement Ponds)*

Stilling ponds will be used to attenuate runoff from works areas of the site of the Proposed Development during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the Proposed Development during the operational phase. The purpose of the stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Stilling ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the stilling pond system. 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. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

The embankment that forms the sloped sides of the stilling ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the stilling ponds area. All material excavated during pond construction will be used locally for landscaping and berm construction around these ponds.

Stilling ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. Otherwise, a swale will be used to carry water exiting the stilling pond system to a level spreader to reconvert the flow to diffuse sheet flow.

Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

3.2.5.3.8 *Siltbuster*

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. The mobile units are specifically designed for use on construction sites.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of Siltbuster units on construction projects.

3.2.5.3.9 *Silt Bags*

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the Site.

Dewatering silt bags are an additional drainage measure that can be used downgradient of the stilling ponds at the end of the drainage swale channels and will be located, wherever it is deemed appropriate, throughout the Site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of silt into the stream.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from Site by a waste contractor with the necessary waste collection permit, who will then transport the silt bag to an appropriate, fully licensed waste facility.

3.2.5.3.10 *Sedimats*

Sediment entrapment mats, consisting of coir or jute matting, will be placed at the outlet of the silt bag 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.

3.2.5.3.11 *Culverts*

All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse.

Some culverts may be installed to manage drainage waters from works areas of the Proposed Development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

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. 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 does not 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.

3.2.5.3.12 *Silt Fences*

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a stream or 100m buffer zone of a lake, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the drainage design drawings included in Appendix 4 of this NIS.

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. The silt fence designs follow the technical guidance document '*Control of Water Pollution from Linear Construction Projects'* published by Construction Industry Research and Information Association (CIRIA, No. C648, 1996). Up to three silt fences may be deployed in series.

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.

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.

3.2.5.3.13 *Forestry Felling Drainage*

Tree felling to facilitate the Proposed Development will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing. Some further turbulence felling may take place after all groundworks have been completed but while turbines are being commissioned (depending on the requirements of the selected turbine manufacturer).

Permanent felling will be undertaken in and around the footprint of the Proposed Development, namely Turbine no. 4 and its associated infrastructure. Temporary felling will be carried out around the turbines to reduce turbulence effects or bat mitigation. Tree stumps will only be removed in areas around the Proposed Development footprint. During tree felling there is a potential to generate silts and sediments in surface water runoff due to tracking of machinery and disturbance of the ground surface etc, however mitigation is provided in Section 9.5.2.1 of Chapter 9 Water (included as Appendix 2 of this NIS) with regard surface water quality protection for this activity which is summarised below. Also, prior to the commencement of tree felling for subsequent road construction the following key temporary drainage measures will be installed:

- All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- Clean water diversion drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry roadside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

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 3 (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, EC, TSS, BOD, Total P, Ortho-P, Total N, 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.

All relevant measures set out in the *Forestry & Freshwater Pearl Mussel Requirements, Forestry & Water Quality Guidelines, Forest Harvesting & the Environment Guidelines and the Forest Protection Guidelines* will apply. To protect watercourses, the following measures will be adhered to during all keyhole/tree felling activities.

- Works will be overseen by an ECoW as described above.
- The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected prior to any machinery being brought on Site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps 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. No direct discharge of such drains to watercourses will occur from within felling areas.
- 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.

- All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones.
- All new collector drains will taper out before entering the aquatic buffer zone to ensures the discharging water gently fans out over the buffer zone before entering the aquatic zone.
- Machine combinations, such as mechanical harvesters or chainsaw felling will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance.
- Mechanised operations will be suspended during and immediately after heavy rainfall.
- Where brash is required to form brash mats, it is to be laid out at harvesting stage to prevent soil disturbance by machine movement.
- Brash which has not been pushed into the soil may be moved within the Site to facilitate the creation of mats in more demanding locations.
- Felling of trees will be pointed directionally away from watercourses.
- Felling will be planned to minimise the number of machine passes in any one area.
- 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. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites.
- 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 removing of natural debris deflectors will be avoided.

3.2.5.4 Cable Trench Drainage

Cable trenches are 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, would be used for landscaping and reinstatements of other areas elsewhere on site or disposed off-site at an appropriate licensed soil recovery facility.

On steeper slopes, silt fences, as detailed in Section 3.2.5.3.11, above, 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.

3.2.5.5 Site and Drainage Management

3.2.5.5.1 *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 amount 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.

3.2.5.5.2 *Pre-emptive Site Drainage Management*

The works programme for the groundworks part of the construction phase of the Proposed Development will also take account of weather forecasts, and predicted rainfall in particular, working under a schedule of works operation system (SOWOR) system as proposed in the planning application. Large excavations, large movements of overburden or large scale overburden or soil 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.

3.2.5.5.3 *Reactive Site Drainage Management*

The final drainage design prepared for the Proposed Development prior to commencement of construction will provide for reactive management of drainage measures. 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 or supervising hydrologist on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the works proceed, to ensure the effectiveness of the drainage design is maintained in so far as is possible. 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, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the ECoW or supervising 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 such as those outlined above will be installed in advance of works recommencing.

3.2.5.6 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works on the Proposed Development. Regular inspections of all installed drainage features 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 ECoW or the supervising hydrologist.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the Proposed Development to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the Proposed Development and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified be reinforcement of the check dam.

Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

Silt traps will be inspected weekly during the construction phase of the Proposed Development and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Development. 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.

3.2.5.7 Construction Phasing and Timing

It is estimated that the construction phase of the Proposed Development will take approximately 18-24 months from starting on Site to the commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the bird breeding season which runs from the 1st of March to the 31st of August inclusive. Construction may commence at any stage from September onwards to the end of February, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.

3.2.5.8 Construction Sequencing

The construction phase can be broken down into three main phases, which overlap partially and will take approximately 18-24 months to complete 1) civil engineering works - 10 months, 2) electrical works including Grid Connection works - 9-12 months, and 3) turbine erection and commissioning - 8 months. The main task items under each of the three phases are outlined below.

Civil Engineering Works:

- Construct new Site roads to temporary compound.
- Clear and hardcore area for temporary Site offices. Install same.
- Construct bunded area for oil storage.
- Construct new Site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.
- Excavate for turbine bases. Place blinding concrete to turbine bases. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days.
- Excavate trenches for Site cables, lay cables and backfill. Provide ducts at road crossings.
- Backfill tower foundations and landscape with previously stored topsoil.
- Complete Site works, reinstate Site.
- Remove temporary Site offices. Provide any gates, landscaping, signs etc. which may be required.

Electrical Works:

- Construct bases/plinths for substation building.
- Install external electrical equipment at substation.
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.
- Construct Grid Connection cabling.

Turbine and Meteorological Mast Erection:

- Erect towers, nacelles and blades.
- Complete electrical installation.
- Grid Connection.
- Install meteorological mast.
- Commission and test turbines.

- Complete Site works, reinstate Site.
- Remove temporary Site offices. Provide any gates, landscaping, signs etc. which may be required.

The phasing and scheduling of the main construction task items are outlined in Figure 3-6 below, where the 1st January has been selected as an arbitrary start date for construction activities.

			Year 1				Year 2			
ID	Task Name	Task Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Site Health and Safty									
2	Grid Connection	Construct grid connection to Athlone 110kV substation								
3	Site Compounds	Site Compounds, site access, fencing, gates								
4	Site Roads	Construction/upgrade of roads, construct underpasses install drainage measures, install water protection measures								
5	Substation and Electrical Works	Constuction substation, underground cabling between turbines								
6	Turbine Hardstands	Excavate/pile for turbine bases where required								
7	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
8	Backfilling and Landscaping									
9	Turbine Delivery and Erection									
10	Substation Commissoning									
11	Turbine Commisioning									

Figure 3-6: Indicative Construction Schedule

3.2.5.9 Construction Phase Monitoring and Oversight

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any development site and submitted for agreement to the Planning Authority is now well-established. The proposed procedures for the implementation of the mitigation measures outlined in such a CEMP and their effectiveness and completion is typically audited by the ECoW on behalf of the Project Developer, in an and objective manner. The basis for auditing is presented in Section 6 of the CEMP which effectively lists all mitigation measures prescribed in any of the planning documentation. The first assessment is a simply Yes/No question, has the mitigation measure been employed on-site or not? Following confirmation that the mitigation measure has been implemented, the effectiveness of the mitigation measures has to be the subject of regular review and audit during the full construction stage of the project. If some remedial actions are needed to improve the effectiveness of the mitigation measure, then these are notified to the site staff immediately during the audit site visit, and in writing by way of the circulation of the findings of the audit. Depending on the importance and urgency of rectifying the issue, the construction site manager is given a timeframe by when the remedial works need to be completed.

A CEMP has been prepared for the Proposed Development, and is included in Appendix 3 of this NIS. The CEMP includes details of drainage, spoil management, waste management etc, and describes how the above-mentioned audit will function and how the findings are presented.

In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval.

The on-site construction staff will be responsible for implementing the mitigation measures specified in this NIS and compiled in Section 6 of the CEMP (see Appendix 3). Their implementation will be overseen by the ECoW or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.

3.2.6 Construction Methodologies

3.2.6.1 Turbine Foundations

Each of the turbines to be erected on the Wind Farm Site will have a reinforced concrete base that is installed below the finished ground level. The turbine foundation may be formed using piling methods or on competent strata (i.e bedrock or subsoil of sufficient load bearing capacity). Where the ground conditions do not have a competent stratum of sufficient load bearing capacity, piling methods will be utilised. Overburden will be stripped off the foundation area to a suitable formation using a 360º excavator and will be stored locally for later reuse in backfilling around the turbine foundation. A two-metre-wide working area will be required around each turbine base, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be sealed using the back of the excavator bucket and surrounded by silt fences to ensure sediment-laden run-off does not occur.

The formation material will have to be approved by an engineer as meeting the turbine manufacturer's requirements. If the formation level is reached at a depth greater than the depth of the foundation, the ground level will have to be raised with clause 804 or similar hardcore material, compacted in 250 millimetres (mm) layers, with sufficient compacted effort (i.e. compacted with seven passes using 12 tonne roller). Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level spreader or settlement pond.

An embankment approximately 600 mm high will be constructed around the perimeter of each turbine base and a fence will be erected to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to 1:12 grade.

There will be a minimum of 100 mm of blinding concrete laid on the formation material positioned using concrete skip and 360º excavator to protect ground formation and to give a safe working platform.

The anchor cage is delivered to the Wind Farm Site in 2 or more parts depending on the turbine type. A 360° excavator or crane with suitable approved lifting equipment will be used to unload sections of the anchor cage and reinforcing steel. The anchor cage is positioned in the middle of the turbine base and is assembled accordingly. When the anchor cage is in final position it is checked and levelled by using an appropriate instrument. The anchor cage is positioned 250mm – 300mm from formation level by use of adjustable legs. Reinforcement bars are then placed around the anchor cage, first radial bars, then concentric bars, shear bars and finally the superior group of bars. Earthing material is attached during the steel foundation build up. The level of the anchor cage will be checked again prior to the concrete pour and during the concrete pour.

Formwork to concrete bases will be propped/supported sufficiently so as to prevent failure. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages. Stage 1 will see the concrete being poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage. Stage 2 will see the centre of the steel foundation being poured and

vibrated to the required level. Stage 3 will see the remaining concrete being poured around the steel foundation to bring it up to the required finished level. After a period of time when the concrete has set sufficiently the top surface of the concrete surface is to be finished with a power float.

Once the base has sufficient curing time it will be backfilled with suitable fill up to existing ground level and finished with the original material that was excavated.

3.2.6.2 Site Roads and Hardstand Areas

3.2.6.2.1 *New Site Access Road*

The construction methodology for the proposed new access roads is outlined as follows as per Section 2.2.2.5 of the CEMP (Appendix 3):

- Establish alignment of the new site road from the construction drawings and mark out the centrelines with ranging rods or timber posts;
- All drainage measures prescribed in the detailed drainage design for the Proposed Development will be implemented around the works area;
- The road layout has been designed to avoid crossings of natural watercourses where possible;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland;
- The subsoil will be excavated down to a suitable formation layer of either firm clay or bedrock and managed on-site in the spoil management areas
- The road will be constructed using well-graded imported granular fill, spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- The new access roads will be constructed with a camber to aid drainage of surface water;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum.
- Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road to be excavated without re-placement with stone fill. This is outlined in further detail in Section 3.2.6.2.2 below.
- The surface of the excavated access roads will be overlaid with approximately 500mm of selected granular fill. Granular fill to be placed in layers in accordance with the designer's specification.
- Access roads to be finished with a layer of capping material across the full width of the road.
- The access tracks will be of single-track design with an overall running width of c.5m. There will be some local widening on the bends, junctions and around turbine bases for the safe passage of large vehicles;
- All excavated material will be managed on-site. Some topsoil will be temporarily stockpiled locally for reuse for landscaping purposes.
- All new roadways will be constructed with a camber to aid drainage of surface water;
- For excavations, side slopes will generally be 1(V): 2 (H), respectively. Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the roads, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.

- The granular fill used to complete the final running surface of the roads on site will be tested to BS812-111:1990 “Ten percent fines value”.
- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.
- The passing bays will be approximately 5m in width and 40m in length where it meets the road network, tapering to 18m in length at the furthest point from the road.
- 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;
- No excavated material will be removed from site with excavated spoil being managed within the site

3.2.6.2.2 *New Site Access Roads in Site-Specific Flood Modelled Zone*

There is 110 metres of proposed access road within site-specific flood modelled 100-yr and 1000-yr zones within the Wind Farm Site. The construction methodology for the proposed new access roads in Site-Specific Flood Modelled Zone is outlined as follows:

- Establish alignment of the new site road from the construction drawings and mark out the centrelines with ranging rods or timber posts;
- All drainage measures prescribed in the detailed drainage design for the Proposed Developemt will be implemented around the works area;
- The road layout has been designed to avoid crossings of natural watercourses where possible;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland;

The access tracks will be of single-track design with a width of 5m with localised widening at bends and changes in direction (depending on the location within the Wind Farm Site);

All spoil excavated will be placed within the identified spoil management areas within the Wind Farm Site, which are located outside the site-specific flood modelled zone (100-yr and 1000-yr events).

The subsoil will be excavated down to a suitable formation layer of competent stratum;

- The road will be constructed using well-graded imported granular fill, spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- The surface of the excavated access roads will be overlaid with approximately 500mm of selected granular fill which will be at least 500mm above the modelled 100-yr and 100-yr flood elevation (100-yr event - 55.86 mOD, 1000-yr event - 56 mOD).
- There is an existing field drain which will be culverted under the proposed access track. This culvert will provide a drainage outlet for flood water following a significant flood event. This will prevent any damming effect from the proposed access road within this section.
- Excavations side slopes shall not generally be greater than 1(V): 2 (H), . Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the road, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.

3.2.6.2.3 *Upgrading of Existing Site Access Road*

Approximately 1.1km of the existing roads will require upgrading which will comprise widening of the roadway to a total running width of approximately five metres, with wider sections at corners and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer.
- All spoil excavated will be placed alongside access roads with cross slopes of less than 10 degrees. As detailed in Section 4.3.3.2, placement of spoil alongside access roads will take place outside of the site-specific flood modelled zones within the Wind Farm Site. Spoil placed alongside access roads will be restricted to a maximum height of 1.0m over a 5m wide corridor on both sides of the access roads.
- All drainage measures prescribed in the detailed drainage design for the Proposed Development will be implemented around the works area;
- Well-graded imported granular fill will be spread and compacted in layers up to 200mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing road surface;
- A layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface where required;
- A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted; and
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4 of the CEMP.

3.2.6.3 Proposed Clear-Span Watercourse Crossing

It is proposed to construct a clear-span watercourse crossing along the Wind Farm Site access roads at 1 no. location using a clear-span bridge. The location of this crossings is shown on the layout drawings included in Appendix 6. The clear-span watercourse crossing methodologies presented below will ensure that no instream works are necessary.

The standard construction methodology for the installation of a clear-span bridge watercourse crossing is as follows:

- The access road on the approach either side of the watercourse 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. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse 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 and will be lifted into place from the bank with no contact with the watercourse.
- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse,
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

The watercourse crossing 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 the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

3.2.6.4 Wind Farm Site Underground Electrical (33kV) and Communication Cabling

The transformer in each turbine is connected to the onsite substation through a network of buried electrical cables. The ground is trenched using a mechanical excavator. The top layer of soil (or road surface) is removed and saved so that it is replaced on completion. The cables will be bedded with suitable material. The cables will be laid at a depth of approximately 1.2m below ground level; a suitable marking tape is installed between the cables and the surface (see Plate 3-4 below illustrating an example of a single cable trench). On completion, the ground will be reinstated as previously described above. The route of the cable ducts will follow the access tracks as illustrated on the site layout drawings included as Appendix 7 of this NIS. The cabling may be located on either side of the road and/or within the road footprint.

Plate 3-4: Typical Cable Trench View

3.2.6.5 Onsite Electricity Substation and Control Buildings

The proposed 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 a nearby spoil management area for later use in landscaping. Any excess material will be sent to one of the on-site spoil management areas .
- The dimensions of the onsite substation area have been designed to meet the requirements of the Eirgrid and the necessary equipment to safely and efficiently operate the Proposed Development;
- 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 are to Eirgrid specifications.

3.2.6.6 Temporary Construction Compounds

The temporary construction 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 will be installed around the perimeter (refer to Section 3.2.5);
- The compound platform will be established using a similar technique as the construction of the excavated site tracks as discussed below;
- 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 hard standings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of waste skips, lubricants, oils and site generators etc.;
- A waste storage area will be provided within the compound;
- 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;
- Upon completion of the construction phase of Proposed Development, the compound will be decommissioned and allowed to re-vegetate naturally, landscaping with topsoil as required;
- During the construction phase, a temporary toilet block unit will located within the temporary construction compound for use during the construction phase. Elsewhere on site, self-contained port-a-loo with an integrated waste holding tank will be used on

site for toilet facilities. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by an appropriately consented waste collector to wastewater treatment plants, and;

- The water supply to the site will be from a temporary water storage tank which will be filled using a mobile water tank which will source water locally as required

3.2.6.7 Grid Connection Cabling Trench

3.2.6.7.1 *Underground Cabling Trench*

The underground cabling works will consist of the installation of ducts in an excavated trench to accommodate power cables, and a fibre communications cables to allow communications between the proposed 110kV onsite substation and the existing110kV Thornsberry substation. Further details are included in the detailed drawings for the Grid Connection underground cabling route infrastructure (see Appendix 7 of this NIS).

The underground electrical cabling will be laid beneath the surface of the Wind Farm Site and the public road using the following methodology:

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts identified. All relevant bodies i.e. ESB, Westmeath County Council, Offaly County Council etc. will be contacted and all up to date drawings for all existing services sought.
- When the cable is located on public roads, a traffic management plan will be prepared prior to any works commencing. A road opening licence will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1200mm, within which the ducts will be laid.
- The cable ducts will be concrete surrounded where they pass under the public road and under drains or culverts.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the ducts will be shimmed up off of the bed of the trench, to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected. Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.
- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,

- The finished surface is to be reinstated, as per original specification. Off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phase of the Proposed Development.
- Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground power cables.

3.2.6.7.2 *Existing Underground Services*

Any underground services encountered along the cable route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations an additional layer of marker tape will be installed between the communications duct and top level yellow marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the proposed ducting, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate, as detailed in the drawings for the Grid Connection Infrastructure (see Appendix 7 of this NIS).

3.2.6.7.3 *Joint Bays*

Joint bays are typically pre-cast concrete chambers where lengths of cable will be joined to form one continuous cable. They will be located at various points along the ducting route generally between 600 to 1000 metres intervals or as otherwise required by ESB/Eirgrid and electrical requirements. Joint Bays are typically 2.5m x 6m x 1.75m pre-cast concrete structures installed below finished ground level.

Where possible, joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. 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. During construction the joint bay locations will be completely fenced off once they have been constructed they will be backfilled until cables are being installed. Once the cabling is installed the joint bays will be permanently backfilled with the existing surface re-instated and there will be no discernible evidence of the joint bay on the ground.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the onsite 110kV substation and the existing 110kV Thornsberry substation. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. 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 in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with an access cover at finished surface level. The locations of the joint bays and chambers are shown in the drawings for the Grid Connection Infrastructure (see Appendix 7 of this NIS).

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers within the planning corridor assessed is subject to approval by ESBN and Eirgrid.

3.2.6.7.4 *Underground Cable Watercourse/Culvert/ Service Crossings*

There are a total of 34 identified watercourse and existing culvert/drain crossings along the proposed Grid Connection underground electrical cabling route, of which 11 no. are EPA/OSI mapped crossings. The remaining crossings are classified as culverts over minor channels or manmade drains. Further

detail on the watercourse, drain and culvert crossings of the underground electrical cabling route are included in Appendix 7 of this NIS.

The construction methodology for the 11 no. EPA/OSI mapped crossings has been designed to eliminate the requirement for in-stream works on these locations requiring a crossing to be constructed to traverse the watercourse with the cabling ducts. A general description of the various construction methods employed at watercourse/ culvert/ drain crossings are described in the following paragraphs below. A list of the EPA/OSI mapped crossings along the underground electrical cabling route and the proposed crossing method is provided in Table 3-3 below. The mapped crossing locations are shown in Appendix 7. An illustration of the proposed crossing methodology at each of the 11 locations is also included in Appendix 7.

The crossing methodologies employed at the other culvert and manmade drain crossings along the underground electrical cabling route, will be selected from the suite of watercourse crossing options outlined below, as appropriate, depending on culvert type, depth, size and local ground conditions.

The crossing locations for the culvert and drain crossing locations along the underground electrical cabling route are shown in Appendix 7 of this NIS, along with the details of all identified culvert and drain crossings.

Should an alternative methodology option be required for individual crossings during the construction process this will be agreed with the relevant authorities including Westmeath County Council and Offaly County Council prior to works commencing.

Where culverts require upgrading, the Applicant will commission a survey of culverts, the results of which will inform the exact details of the upgrade works which will be forwarded to the relevant Local Authority. Having regard to the duration of the consent requested (10 years) it is considered best practice that any such surveys be carried out prior to construction to facilitate accuracy and timely reporting of the surveys.

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.

Standard Formation Crossing over Culvert – Option A

Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench as outlined in Appendix 7.

Where no crossing currently exists, the cable will pass over the watercourse in a bottomless box culvert or pre-cast concrete slab in a standard trefoil arrangement. Where required existing culvert crossings will be extended using appropriately sized corripipe.

Standard Formation Crossing under Culvert – Option B

Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is not available over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe, as outlined in Appendix 7

Shallow Formation Crossing over Culvert – Option C

Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover

available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.

Where sufficient deck cover is not available to fully accommodate the required ducts, it may be necessary to locally raise the footpath level if present, or to locally raise the pavement level. Should the footpath or pavement level be increased, the parapet wall levels will also increase to facilitate the raise in pavement level if required, Any addition of a new pavement will be tied back into the existing road pavement at grade. This method of duct installation is further detailed in Appendix 7.

Directional Drilling – Option D

In the event that none of the above methods are appropriate, directional drilling (DD) will be utilised.

DD 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 DD method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, for the directional drilling at watercourse/culvert crossings listed in Table 3-3 below. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the Site in the same manner as other subsoil materials associated with the drilling process to a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exits. The directional drilling methodology is further detailed in Appendix 7.

Table 3-3: Underground Electrical Cabling Route – Watercourse Crossings Methodology

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works	Grid Connection Infrastructure Reference (included as Appendix 7)
1	Stone Culvert	-	0.6	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 7: Figure 1
2	Concrete Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 7: Figure 2
3	Stone Arch Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 7: Figure 3
4	Stone Arch Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling.	Option D	None. No in-stream works required.	Appendix 7: Figure 4

				This crossing methodology will ensure that no contact will be made with the watercourse during the works.			
5	Concrete Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 7: Figure 5
6	Stone Arch Bridge	-	1.2	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 7: Figure 6
7	Open channel	3.9	-	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 7: Figure 7
8	1500 mm Concrete Pipe	-	0.9	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location.	Option C	None. No in-stream works required.	Appendix 7: Figure 8

				The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.			
9	600mm Concrete Pipe	-	0.9	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 7: Figure 9
10	1200mm Concrete Pipe	-	1.6	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A	None. No in-stream works required.	Appendix 7: Figure 10
11	Box Culvert Bridge	-	1	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 7: Figure 11

3.2.7 Operation

The Proposed Development is expected to have a lifespan of approximately 30 years. As part of the Wind Farm Site planning application, permission is being sought for a 30-year operation period commencing from the date of full operational commissioning of the Proposed Development. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of meteorological equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together and data relayed from the wind turbines to a central control unit at the on-site substation which will facilitate off-site remote monitoring of the wind farm. Each turbine will be monitored off-site by the appointed Operations and Maintenance contractor (typically the wind turbine manufacturer) and also a wind farm operations management company. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored off-site by both parties 24-hours per day. Regular on-site visual inspections will also be carried out by the wind farm operations management company.

3.2.7.1 Maintenance

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

The electricity substation components as part of the Grid Connection will also require periodic maintenance.

3.2.7.2 Monitoring

Section 7 of the CEMP sets out a programme of monitoring required for the operational phase of the Proposed Development. Table 7-1 of the CEMP should be consulted for detailed information on all the monitoring requirements during the operational phase, however a brief summary of the key information is provided below:

- Monthly sampling and laboratory analysis will be undertaken for six months during the operational phase.
- 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.
- Post-construction bird monitoring which includes breeding bird surveys, winter roost surveys and corpse searching on the Site determine the level of fatalities for the Site as a result of collisions with the installed turbines. These surveys will be completed in accordance with guidelines issued by the Scottish Natural Heritage (SNH, 2009)
- Post-construction bat monitoring will be undertaken for at least three years' post construction of the renewable energy development. The monitoring will also include corpse searching in the areas surrounding the turbines to gather data on any actual collisions.
- Post-construction linear habitat restoration monitoring following the main growing season (i.e. in September) in a given year for the first five years of growth

- Monitoring for shadow flicker at properties where any exceedance of the shadow flicker limit has been predicted as outlined in Chapter 5.
- Post turbine commissioning noise monitoring.

3.2.8 Decommissioning

The wind turbines proposed as part of the Wind Farm Site are expected to have a lifespan of approximately 30 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Wind Farm Site may be decommissioned fully.

Upon decommissioning of the Wind Farm Site, the wind turbines will be disassembled in reverse order to how they were erected. The turbines will be disassembled with a similar model of crane that was used for their erection. The turbine will likely be removed from Site using the same transport methodology adopted for delivery to Site initially. The turbine materials will be transferred to a suitable recycling or recovery facility.

The underground electrical cabling connecting the turbines to the on-site substation will be removed from the cable ducts. The cabling will be pulled from the cable ducts using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at the original cable jointing pits which will be excavated using a mechanical excavator and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility.

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 unnecessary environment emissions such as noise, dust and/or vibration.

Site roadways could be in use for purposes other than the operation of the Proposed Development by the time the decommissioning of the Wind Farm Site is to be considered, and therefore it may be more appropriate to leave the Site roads in situ for future use. It is envisaged that the roads will provide a useful means of extracting the commercial forestry crop which exists on the Site, and as agricultural roads.

The Grid Connection underground electrical cabling route and onsite substation will remain in place as it will be under the ownership and control of the ESB and Eirgrid.

A Decommissioning Plan has been prepared (Appendix 4-6) the detail of which will be agreed with the local authority prior to any decommissioning. 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 agreed with the competent authority at that time. The potential for effects on European Sites during the decommissioning phase of the Proposed Development has been fully assessed in this NIS.

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 Proposed Development, 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".*

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 Ecological Survey Methodologies

4.1.1 Desk Study

The desk study undertaken for this assessment included a thorough review of the available ecological data associated with the screened-in European Sites within the likely zone of impact of the Proposed Development. Sources of data included the following:

- Review of NPWS Conservation Objectives supporting documents, site synopsis, standard data forms and supporting documents for EU Designated Sites,
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA), IFI fish maps
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper,
- Review of NPWS Article 17 metadata and GIS database

4.1.2 Ecological Multidisciplinary Walkover Surveys

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological baseline conditions are those existing in the absence of proposed activities (CIEEM, 2018).

A multidisciplinary ecological walkover survey of the Proposed Development site was carried out on the 29th July 2021, 4th August 2021, 17th of February 2022, 11th of March 2022, 8th of April 2022 and the 19th of August 2022 in line with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) by Patrick Ellison (BSc., MSc., ACIEEM), Cathal Bergin (BSc), Rudraksh Gupta (BSc., MSc), Laura McEntagart (BSc.), Laoise Chambers (BSc.) Cora Twomey (B.SC) and Brónagh Boylan (B.Sc.) of MKO. These surveys provided baseline data on the ecology of Site and assessed whether further detailed habitat or species-specific ecological surveys were required. The multi-disciplinary ecological walkover surveys comprehensively covered the entire Site.

Habitats within the Site were classified in accordance with the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). Habitat mapping was undertaken with regard to guidance set out in 'Best Practice Guidance for Habitat Survey and Mapping' (Smith et al., 2011). 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).

The walkover survey was designed to detect the presence of, or suitable habitat for, a range of protected faunal species that may occur in the Site and the vicinity of the Proposed Development. During the multidisciplinary survey, a search for Invasive Alien Species (IAS), with a focus on those

listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011), was also conducted.

4.1.2.1 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).

4.1.3 Faunal Surveys

4.1.3.1 Otter Survey

The Dungolman River and the Mullenmeehan stream flows through and adjacent to the Wind Farm Site boundary, and converge in the northern part of the Wind Farm Site. Sections of two other order 2 streams (the Moneynamanagh and the Raheen 26) also occur within the Wind Farm Site. Additionally, the Grid Connection underground electrical cabling route will require the crossing of watercourses at existing crossing and culvert locations; 34 crossings are identified along the proposed underground electrical cabling route of which 11 no. are EPA/OSI mapped crossings. These watercourses were identified as providing potential habitat for otter, and were subject to specialist targeted surveys on the 17th February 2022, along with other watercourses within the Site, and during dedicated aquatic site surveys carried out during August 2022.

The otter survey was conducted as per TII (2009) 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. Where possible a distance of 150 up and downstream from each watercourse crossing was searched for evidence of the species. 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 survey also followed the guidance as set out in NRA (2008) *'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[2]).

4.1.3.2 Bird Surveys

4.1.3.2.1 *Current Survey Data*

Baseline ornithology surveys were conducted during the period of April 2019 to March 2021, consisting of two breeding seasons (April – September) and two non-breeding seasons (October – March), and were carried out in accordance with the relevant NatureScot (formerly SNH) Guidance (SNH 2017). Full details are presented in the relevant survey reports (see Appendix 5) with a summary provided below.

The survey areas used for the ornithological impact assessment differ according to receptor as recommended by relevant good practice survey guidance (SNH, 2017). These are summarised in the sections below and are described in more detail within the baseline survey reports (Appendix 5).

[2] *CIEEM, 2013, Technical Guidance Series – Competencies for Species Survey, Online, Available at: https://cieem.net/resource/competencies-for-species-survey-css/ Accessed: 20.03.2021*

4.1.3.2.2 *Flight Activity Surveys*

Vantage point surveys were undertaken in accordance with SNH (2017) from April 2019 to March 2021. These surveys aimed to monitor flight activity on the Wind Farm Site to a 500m radius of the potential turbine positions. Surveys were conducted monthly throughout this period from two fixed point vantage points with comprehensive coverage of the Wind Farm Site (Figure 7-1 of Appendix 5). The vantage point locations were selected by undertaking a viewshed analysis (described below) and confirmed by a recce visit and initial field surveys to ensure that the proposed turbine layout is entirely covered. Surveys were also undertaken from an additional five supplementary vantage point locations between April and September 2019 (Figure 7-3 of Appendix 5). Surveys at these vantage point locations was ceased due to a reduction in the extent of the Wind Farm Site.

Viewshed analysis was carried out to inform coverage of the Wind Farm Site from the fixed vantage point location. A 500m buffer was applied to the outermost potential turbines, in line with SNH (2017). Viewsheds were calculated using Resoft Wind Farm ZTV (Zone of Theoretical Visibility) software in combination with Mapinfo Professional (Version 10.0) using a notional layer suspended at the minimum height considered for the Potential Collision Risk Area based on potential turbine models at the time the vantage point locations were selected. The notational layer was suspended at 20m. Note that while the relevance of being able to view as much of the site to ground level is acknowledged, the NatureScot guidance emphasises the importance of visibility of the 'collision risk volume' when the data is to be used to estimate the risk of collision with turbines by birds.

The viewshed analysis aims to identify the most suitable locations to site vantage points such that the airspace of the turbine rotor swept area is in view. The analysis aims to achieve this using the fewest possible number of vantage points. The vantage point locations were tested for visibility coverage by creating a viewshed point 1.5m in height (to represent the height of observer) on a map using 10m contours terrain data. The relative height of any surrounding forestry and its effects on visibility is also accounted for in the analysis. Using the ZTV software, a viewshed of 360 degrees was produced calculating an area from the height of the notational layer above ground level up to a 2km radius. The resulting viewshed image was then cropped to 180 degrees to give the viewshed, in line with SNH (2017). The visible viewshed is presented in Figure 7-2 within Appendix 5. The visible viewshed for the additional five supplementary vantage point locations is presented in Figure 7-4 within Appendix 5.

Data on bird observations and flight activity was collected from a scanning arc of 180˚and a 2km radius by an observer at the fixed vantage point locations for two 3-hour watches separated by a minimum 30 minute break (ie. 6 hours total) per month. Surveys were scheduled to provide a spread over the full daylight period, including dawn and dusk watches to coincide with the highest periods of bird activity. Along with target species, the presence of any additional (non-target) species observed was recorded to inform the evaluation of supporting habitat. The survey effort is presented in Appendix 5 of this NIS, including full details of dates, times and weather conditions. Table 4-1 below provides a brief summary of the survey effort. Note that data from VP1 and VP3 was used to inform the collision risk assessment and receptor evaluation. Supplementary VP2, VP2a, VP2b, VP4 and VP4a provide additional supporting data.

Table 4-1 Vantage point survey effort

Survey Season	Months	Effort per Vantage Point
2019 Breeding Season (2 VPs and 5 *supplementary VPs*)	Apr - Sep	36 hours at VP1 36 hours at VP3 *18 hours at VP2* *6 hours at VP2a* *6 hours at VP2b*

		24 hours at VP4 *6 hours at VP4a*
2019/2020 Non-Breeding Season (2 VPs)	Oct – Mar	36 hours at VP1 36 hours at VP3
2020 Breeding Season (2 VPs)	Apr – Sep	36 hours at VP1 36 hours at VP3
2020/2021 Non-Breeding Season (2 VPs)	Oct - Mar	36 hours at VP1 36 hours at VP3

Each flight observation was assigned a unique identifier when mapped in the field and subsequently digitised using QGIS software. Observed flight activity was recorded as per defined flight bands. Bands were split into 0-10m, 10-25m, 25-175m and >175m. All flight activity within the height bands 10-25m, 25-175m and >175m is considered to be within the Potential Collision Height (PCH) with regard to the proposed turbine swept area.

4.1.3.2.3 *Breeding Walkover Surveys*

Breeding walkover surveys were undertaken to determine possible, probable or confirmed breeding bird activity within the Wind Farm Site to a 500m radius. The methodology was based on Brown and Shepherd (1993) and Calladine *et al.* (2009), combined with Common Bird Census methods (British Trust for Ornithology, 2021) for dense habitat, as per SNH (2017) recommendations. Transect routes were walked across different habitat complexes where access allowed. The surveyor regularly scanned with their binoculars the wider surroundings of each transect for target species. Along with target species, the presence of all additional (non-target) species observed were recorded to inform the evaluation of supporting habitat.

Breeding walkover surveys were conducted in daylight hours (08:00-18:00) over three visits during the core breeding season months April to July. Survey effort is presented in Appendix 5, including full details of dates, times and weather conditions for each survey Figure 7-5 within Appendix 5 shows the survey area.

4.1.3.2.1 *Winter Walkover Surveys*

Winter walkover surveys were undertaken to record the presence of bird species within the Wind Farm Site to a 500m radius. The methodology was adapted from the breeding walkover surveys outlined above. Transect routes were walked across different habitat complexes within the surveyed area where access allowed. Along with target species, the presence of all additional (non-target) species observed were recorded to inform the evaluation of supporting habitat.

Winter walkover surveys were conducted in daylight hours over four visits between October and March (ie. four visits in winter 2019/2020 and four visits in winter 2020/2021). All target species observations were mapped. Survey effort is presented in Appendix 5, including full details of dates, times and weather conditions for each survey. Figure 7-5 within Appendix 5 shows the survey area.

4.1.3.2.2 *Breeding Raptor Surveys*

Raptors include all harrier, falcon, buzzard, eagle, hawk, owl, kite and osprey species. Breeding raptor surveys were undertaken within the Wind Farm Site and within a 2km radius. Survey methodology followed Hardey *et al.* (2013), as per SNH (2017) recommendations. All raptor species were recorded

during these surveys to identify occupied raptor territories and monitor their breeding success within the surveyed area.

Breeding raptor watches of 3 hours (supplemented by transects if necessary) were conducted at nine raptor vantage point (RVP) locations during daylight hours. Raptor vantage points were surveyed once per month during the core breeding season between April and July. However, due to COVID-19 restrictions, a visit was not conducted in April 2020. Survey effort is presented in Appendix 7-2, including full details of dates, times and weather conditions Figure 7-6 within Appendix 5 shows the RVPs.

4.1.3.2.3 *Waterbird Distribution Surveys*

Waterbirds include: swans, geese and ducks; cormorant, shag, divers and grebes; auks and seabirds; gulls, terns and skuas; herons, egrets and crane; rails and crakes; waders; and kingfisher. Significant wetlands and waterbodies within 5km of the Wind Farm Site were surveyed for waterbirds during the 2019/2020 and 2020/2021 winter and passage seasons (August to May inclusive). However, due to COVID-19 restrictions, a visit was not conducted in April 2020. The area surveyed exceeds the 500m for foraging waterbirds and 1km for roosting waterbirds requirements of SNH (2017) and follows the recommendations of SNH (2016).

Survey methodology follows Gilbert *et al.* (1998) and the Irish Wetland Bird Survey (BirdWatch Ireland, 2021), as recommended by SNH (2017). Surveys were undertaken during daylight hours from suitable vantage points at wetlands and waterbodies. Target waterbird species observed were mapped. Survey effort, including details of survey duration and weather conditions, is presented in Appendix 5. Figure 7-7 of Appendix 5 shows the surveyed area.

4.1.3.2.4 *Multidisciplinary Walkover Survey*

The Grid Connection underground electrical cabling route was surveyed in February and March 2022 through a multidisciplinary walkover survey. The route was systematically walked, while the surveyor recorded a range of protected species, including birds.

4.2 Ecological Survey Results

4.2.1 Wind Farm Site

4.2.1.1 Description of Habitats and Flora within the Wind Farm Site Ecological Survey Area

A total of eleven habitats were recorded within the Wind Farm Site and the extended Ecological Survey Area including;

- Improved agricultural grassland (GA1)
- Wet grassland (GS4)
- Scrub (WS1)
- Arable land (BC1)
- Conifer Plantation (WD4)
- Drainage Ditches (FW4)
- Hedgerows (WL1)
- Treelines (WL2)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)
- Buildings and Artificial Surfaces (BL3)

Habitat maps of the Wind Farm Site are provided in Figure 4-1 and 4-2.

4.2.1.1.1 *Improved Agricultural Grassland (GA1)*

The majority of the lands within the Wind Farm Site comprise Improved agricultural grassland (GA1) pasture. The sward within most fields of this nature was dominated by perennial rye grass (*Lolium perenne*), and Italian ryegrass (*Lolium multiflorum*), with Yorkshire fog (*Holcus lanatus*), cock's foot (*Dactylus glomerata*) couch (*Elytrigia repens*) and Timothy (*Phleum pratense*) grasses also recorded at field margins where grass had grown longer. Much of the grassland was very species-poor, and comprised almost exclusively ryegrass species; however herb species typical of agricultural grassland were also present to varying degrees, and included white clover (*Trifolium repens*), creeping buttercup (*Ranunculus repens*), broadleaf dock (*Rumex obtusifolius*), common sorrel *(Rumex acetosa),* thistle spp. (*Cirsium* spp.), daisy (*Bellis perennis*) and red clover (*Trifolium pratense*). These areas of grassland are under agricultural management and heavily grazed by livestock. In some areas, the improved agricultural grassland habitat graded into wet grassland (see below). The majority of turbines and the Proposed Development infrastructure are located within improved agricultural grassland habitat.

Plate 4-1:Species-poor Improved agricultural grassland (GA1) within the southern portion of the Wind Farm Site, this habitat is typical of the majority of the grassland within the Wind Farm Site. In the background, grass is growing longer at the field margins, and hedgerow forms the field boundary.

Plate 4-2; Improved agricultural grassland (GA1) in the central part of the Wind Farm Site.

4.2.1.1.2 Wet Grassland (GS4)

Areas of wet grassland were recorded within fields and in some cases comprised entire fields in poorly draining parts of the Wind Farm Site. These areas were characterised by abundant cover of soft rush (*Juncus effusus*) and hard rush *(Juncus inflexus),* in addition to other species listed above.

The rush dominated wet grassland was also characterised by an abundance of species such as Yorkshire fog grass, (*Jacobaea vulgaris*), silverweed (*Potentilla anserina*), creeping Buttercup and marsh thistle *(Cirsium arvense).* In some areas salad burnet (*Sanguisorba minor*), common knapweed (*Centaurea nigra*), common sorrel, creeping fescue (*Festuca rubra*), marsh woundwort (*Stachys palustris*), common bird's foot trefoil (*Lotus corniculatus*), self-heal (*Prunella vulgaris*) and common field speedwell (*Veronica persica*) were also recorded. Some of these areas grazed by cattle had evidence of poaching due to the wet ground conditions. This habitat occurred adjacent to improved agricultural grassland (GA1) in many fields (see Plate 6-3). Other wetter fields were recorded where abundant yellow flag iris (*Iris pseudacorus*) and meadowsweet (*Filipendula ulmaria*) were the characteristic species (see Plate 4-3 and 4-4).

Plate 4-3: Area of Wet grassland (GS4) adjacent to Improved agricultural grassland (GA1)

Plate 4-4: Wet area of field within the central part of the Wind Farm Site characterised by abundant yellow flag iris and meadowsweet.

4.2.1.1.3 Dry Meadows and Grassy Verges

Some areas of grassland within the Wind Farm Site, mostly associated with field edges had been allowed to grow rank and were not actively managed at the time of the surveys. These areas were characterised by species such as Yorkshire fog, creeping bent (*Agrostis stolonifera*), cock's foot grass, Timothy grass.

Unmanaged dry meadow and grassy verge habitat was also recorded within the central southern area of the Wind Farm Site, in the lads associated with an abandoned derelict property here (Umma House). These areas were characterised by an abundance of dock, and ragwort, with frequent creeping buttercup, white clover, ribwort plantain (*Plantago lanceolata*), creeping thistle, silverweed and occasional red bartsia (*Odontites vernus*).

Areas of tall ruderal vegetation was present associated with these areas within the Site including species such as common nettle, ragwort, cleavers (*Galium aparine*), hogweed (*Heracleum sphondylium*) and willowherb (*Epilobium*) spp., with tufted vetch (*Vicia cracca*), meadowsweet, sow thistle (*Sonchus arvensis*), rosebay willowherb (*Chamaenerion angustifolium*), In wetter areas star sedge (*Carex echinate*), purple loosestrife (*Lythrum salicaria*) and meadowsweet were regularly recorded.

4.2.1.1.4 Conifer Plantation (WD4)

An area of **Conifer planation (WD4)** forestry habitat is present within the western area of the site. The conifer plantation within the Wind Farm Site represented primarily post thicket semi-mature plantation forestry. These forestry blocks were dominated by Sitka Spruce (*Picea sitchensis*). Very little ground flora was present in densely planted areas, with moss spp. and horsetails (*Equisetum arvense*) occasional dewberry (*Rubus caesius*).

Along the edges of stands of conifer and within firebreaks these are lined with mature broadleaf tree lines comprised primarily of ash (*Fraxinus excelsior)*. The trunks of many of these trees were covered in dense ivy (*Hedera helix*). Young alder (*Alnus glutinosa*) trees were also regenerating in these areas, and the ground flora comprised species such as Yorkshire fog, sweet vernal grass, pendulous sedge (Carex pendula), Timothy (*Phleum pratense*), cock's foot, creeping bent (*Agrostis stolonifera*), creeping red fescue (*Festuca rubra*), lesser stitchwort (*Stellaria graminea*), yellow flag iris and patches of bramble.

Plate 4-5: Example of Conifer Plantation (WD4) habitat within the western area of the Wind Farm Site.

Plate 4-6: Example of limited ground flora present within the conifer plantation habitat.

Plate 4-7: Example of mature broadleaf tree line at edge of conifer plantation habitat.

4.2.1.1.5 Scrub (WS1)

A number of small areas of scrub were recorded within the study area. These areas occurred as patches of scrub within fields and encroaching into fields from hedgerow, with goat willow abundant in wetter areas. Patches of scrub associated with more open areas comprised predominately of gorse (*Ulex europaeus*). Patches of hawthorn scrub were present in places within conifer plantation.

Plate 4-8: Dense Scrub (WS1) associated with field edges and adjacent to conifer plantation

4.2.1.1.6 Hedgerow (WL1)

An extensive network of hedgerow occurs within the Wind Farm Site and formed the boundaries to the agricultural fields, the majority of which had Drainage ditches (FW4) also associated with them (see below). Hedgerows that made up the field boundaries comprised primarily hawthorn (*Crataegus monogyna*) and blackthorn (*Prunus spinosa*), with standard ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*) trees at intervals. Hazel (*Corylus avellana*), elder (*Sambucus nigra*), goat willow (*Salix caprea*), guelder rose (*Viburnum opulus*) spindle (*Euonymus europaeus*), dog rose (*Rosa canina*) and gorse were also recorded within hedgerow in parts of the Wind Farm Site.

Ground flora commonly associated with the hedgerows within the Wind Farm Site included bramble, dewberry, creeping thistle, hogweed, horsetail, great willowherb (*Epilobium hirsutum*), marsh woundwort, cuckooflower, silverweed and mosses including *Rhytidiadelphus squarrosus* and *Thuidium tamariscinum.*

4.2.1.1.7 Treeline (WL2)

Where linear 'hedgerow' features were over 5m in height and were made up of semi-mature and mature trees these were characterised as treelines, with ash and sycamore making up the majority of the tree cover within the Site along with beech (*Fagus sylvatica*) occasional and unmanaged hawthorn.

Mature treelines were also recorded along the edges of stands of conifer and within firebreaks these were comprised primarily of ash (*Fraxinus excelsior)* exceeding 20m in height. The trunks of many of these trees were covered in dense ivy. Other tree species present in these areas between conifer stands were alder and sycamore.

Plate 4-9: Ash treeline making up a field boundary within the central area of the Site.

4.2.1.1.8 Drainage Ditches

An extensive network of drainage ditches is present within the site, the majority associated with field boundary hedgerows. Where these hedgerows are well established, there was comparatively little in-channel vegetation associated with the ditches; here ivy and hart's tongue fern (*Asplenium scolopendrium*) were abundant with often dense bramble (see Plate 4-10). In places the were muddy and heavily poached by livestock where there was a suitable access point nearby (see Plate 4-11).

Where wet ditches occurred in more open habitat a variety of semi-aquatic and aquatic species were recorded (see Plate 4-12) including meadowsweet, water mint (*Mentha aquatica),* yellow flag iris, bush vetch (*Vicia sepium*), tufted vetch, silverweed, square stalked Saint-John's wort (*Hypericum tetrapterum*), branched bur reed (*Sparganium erectum*), fool's watercress (*Apium nodiflorum*) and brooklime (*Veronica beccabunga*).

Plate 4-10: Wet ditch within established hedgerow

Plate 4-11: Heavily poached section of drainage ditch within long established hedgerow.

Plate 4-12: Wet ditch within the eastern part of the site; a lack of hedgerow has allowed in-channel vegetation to establish.

4.2.1.1.9 Spoil and bare ground (ED2)

The existing unpaved tracks and roadways within the Wind Farm Site have been classified as spoil and bare ground (ED2). This includes primarily farm tracks to allow vehicle and machinery access to fields; no access tracks are present within the forestry. Species recorded starting to take hold on some bare ground areas included Autumn hawkbit (Scorzoneroides autumnalis), broad leaved plantain (Plantago major), Timothy grass, creeping thistle, horsetail, pineappleweed (*Matricaria discoidea*), ribwort plantain and sow thistle.

Plate 4-13: Areas of disturbed bare ground and farm tracks that were not gravelled or hardstand were classified as Spoil and bare ground.

Plate 4-14: Area classified as Spoil and bare ground in the central northern area of the Wind Farm Site.

4.2.1.1.10 Recolonising bare ground (ED3)

A number of areas where ground disturbance has been undertaken in the recent past have begun to recolonise, see Plate 6–13. These areas are small in area and occur as part of a mosaic with other habitat as such, have not been mapped in detail.

Plate 4-15: Patch of recolonising bare ground within grassland field within the northern part of the Wind Farm Site.

4.2.1.1.11 Depositing Lowland Rivers (FW2)

A number of watercourses cross the study area which flow to the west along the northern and southern boundaries of the Site before converging within the western portion of the Site and flowing towards the north of the Site, bisecting the Site (see Figure 4-1). These watercourses are classified as Depositing Lowland Rivers (FW2). Most are approximately two to four metres in width, and are generally characterised by a bottom substrate of bedrock, small cobbles and small and large gravels, although some had muddy substrate.

Additional details of representative watercourses within the Wind Farm Site is provided in Appendix 2 of this NIS.

Plate 4-16: Section of flowing watercourse associated with the northern Site boundary, classified as Depositing lowland river (FW2).

4.2.1.1.12 Buildings and Artificial Surfaces (BL3)

Farm buildings within the Wind Farm Site comprise of agricultural sheds and a derelict dwelling house. These were categorised as Buildings and artificial surfaces (BL3), see Plate 6-15 & 6-16. Hardstanding areas and roads within the Site boundary were also classified as BL3.

Plate 4-17: Agricultural sheds and hardstanding areas within the centre of the eastern portion of the Site, classified as Buildings and artificial surfaces.

4.2.1.2 Habitats on the Turbine Delivery Route

The proposed turbine route goes from Port of Galway to the north of the site where the route enters the site boundary via R390. This route will be located within the carriageway/verge of existing public roads networks. There is no requirement to use habitats located outside the road carriageway until the route enters the Proposed Development site. All roads within/adjacent to the proposed turbine delivery route were classified as Building and Artificial Surfaces (BL3). Much of the proposed turbine delivery route is bordered by a verge supporting Dry Meadows and Grassy Verges (GS2).

Habitats recorded beyond the road boundary included Improved Agricultural Grassland (GA1), Wet Grassland (GS4), Arable crop (BC1), Depositing/lowland river (FW2), Drainage ditches (FW4), Buildings and artificial surfaces (BL3), and Conifer Plantation (WD4). Less frequently recorded habitats included Mixed Woodland (WD2), Broadleaved Woodland (WD1), Cutover Bog (PB4), Amenity Grassland (GA2), Exposed sand, gravel or till (ED1) and Spoil and bare ground (ED2).

4.2.1.3 Invasive Alien 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.

No third schedule species were recorded within the wind farm site.

4.2.2 Grid Connection

4.2.2.1 Description of Habitats and Flora along the Grid Connection

The Grid Connection onsite substation and temporary construction compound are located within the Wind Farm Site, and are located on lands made up of wet grassland, as detailed in Section 4.5.2.1.2 above

The majority of the lands on either side of the road along the length of the Grid Connection underground electrical cabling route is made up of improved agricultural grassland, with associated Stonewalls and other stonework (BL1), hedgerow (WL1), Treelines (WL2), spoil and bare ground (ED2), associated buildings with depositing lowland rivers (FW2) and drainage ditches (FW4) crossing the underground electrical cabling route.

Plate 4-18: Example of a section of the existing Tinnycross Road in which part of the underground electrical cabling route is to be located, categorised as Buildings and artificial surfaces (BL3), with associate road verge, scrub and hedgerow.

A number of watercourses (classified as Depositing lowland rivers (FW4)) occur along the underground electrical cabling route. There are a total of 34 identified watercourse and existing culvert crossings along the underground electrical cabling route, of which 11 no. are EPA/OSI mapped crossings. The remaining crossings are classified as culverts over minor channels or manmade drains. Watercourses were generally slow flowing with a cobble or muddy substrate, see Plate 4-20. The construction methodology for the 11 no. EPA/OSI mapped crossings has been designed to eliminate the requirement for in-stream works on these locations requiring a crossing to be constructed to traverse the watercourse with the cabling ducts. A general description of the various construction methods employed at watercourse/ culvert/ drain crossings are described in Section 3.2.6.7.4, of this NIS.

Plate 4-19: Example photo of an existing watercourse crossing occurring on the underground electrical cabling route (Watercourse ref. WC6).

4.2.3 Fauna

4.2.3.1 Otter

As per the Otter Threat Response Plan NPWS (2009), Otters occupy exclusive home ranges averaging 7.5 ± 1.5km. As the Proposed Development site is located approximately 9km from the Lough Ree SAC at it's closest point there is low/minimal potential for the Proposed Development to impact on the SAC population in relation to habitat loss, fragmentation, or disturbance. The only potential for impact relates to a reduction in water quality which could impact the supporting habitat of the species in the SAC.

In order to determine if the Proposed Development site was utilised by a local non-SAC population of Otter a dedicated target survey was conducted. This included a survey of watercourses within and adjacent to the Proposed Development footprint and surveys where aquatic macroinvertebrate sampling was carried out along rivers outside of the Proposed Development site

Watercourses within the Wind Farm Site provide suitable habitat for otter, and evidence of the species was recorded in the form of spraint and feeding remains along the Dungolman River within the Wind Farm Site. One notable area where a concentration of spraint and feeding remains was recorded was at a location in the south-western area of the Wind Farm Site, just downstream of where the Moneynamanagh [26M40] watercourse meets the Dungolman [26D06] watercourse (see Figure 4-3 and Plates 4-21 and 4-22).

No otter holts or other resting places were recorded during any of the ecological surveys.

Plate 4-20: Shallow section of watercourse within the south-western area of the Wind Farm Site where abundant otter spraint and feeding remains were recorded.

Plate 4-21: Otter spraint recorded at this location.

4.2.3.2 Birds – Wind Farm Site

Extensive bird surveys were undertaken to inform the assessment and have been reviewed in the preparation of this NIS. As fully described in Section 4.1.2.3, 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 following species that were recorded during ecological and dedicated bird surveys carried out at the Wind Farm Site are relevant to the assessment of potential impacts on the Lough Ree and the Middle Shannon Callows SPAs. Only bird species listed as SCIs of these SPAs are described below.

- [A004] Little Grebe (*Tachybaptus ruficollis*)
- [A038] Whooper Swan (*Cygnus cygnus*)
- [A052] Teal (*Anas crecca*)
- [A053] Mallard (*Anas platyrhynchos*)
- [A061] Tufted Duck (*Aythya fuligula*)
- [A142] Lapwing (*Vanellus vanellus*)
- [A179] Black-headed gull (*Chroicocephalus ridibundus)*

Detailed maps and raw data are provided in Chapter 7: Ornithology of the EIAR that was prepared in support of the planning application, and included as Appendix 5 to this NIS.

4.2.3.2.1 *Little Grebe*

Little grebe was recorded during the winter, passage and breeding seasons. Little grebe was recorded 6 times during waterbird distribution surveys in the months of November, January, February, March and May. All observations were from Lough Sewdy and comprised of single birds calling and foraging.

4.2.3.2.2 *Whooper Swan*

Whooper swan were observed in the passage and winter season. Whooper swan were recorded on four occasions during vantage point surveys. These observations comprised small groups of 2-5 birds in flight over the Wind Farm Site on two days in November 2020, and a flock of 21 birds recorded in late March 2021.

4.2.3.2.3 *Teal*

Teal was recorded during the passage and winter seasons. There was one observation of teal during vantage point surveys, comprising a flock of 4 birds travelling in March 2021. Time at PCH was 16s. Teal were recorded 4 times during winter walkover surveys, in the months of December and January. All observations were of birds flushed from watercourses within the Wind Farm Site. Flock sizes were between 2-8 birds. Teal were recorded 4 times during waterbird distribution surveys, in the months of December, January and March. Observations comprised individual birds at Lough Sewdy, a flock of 5 birds feeding in flooded agricultural field approximately 300m south-east of the Wind Farm Site, and a flock of 32 birds on a small lake in Calliaghstown, approximately 2km north of the Wind Farm Site.

4.2.3.2.4 *Mallard*

Mallard was recorded during the breeding, passage and winter seasons. Mallard was recorded 15 times during vantage point surveys, during the months of March, April, June July, August and November. Of these observations, 13 were within, or partially within, the Wind Farm Site. Flock sizes were between 1-6 birds and involved 290s at PCH. There was one observation of 2 mallard landing within the Wind Farm Site. Mallard was recorded 3 times during winter walkover surveys, from the months of October,

January and March. Observations comprised birds travelling over study area, and of birds being flushed from river within Wind Farm Site. Flock sizes were between 2-3 birds. Mallard was recorded 3 times during breeding walkover surveys, all within the month of May. Birds were recorded travelling over Wind Farm Site with flock sizes of 1-2 birds, and an adult was recorded with 10 young on river within Wind Farm Site. Mallard were recorded 23 times during waterbird distribution surveys, from the months of September, October, November, December, January, February, March and May. The majority of observations were from Lough Sewdy, and comprised birds on water and travelling over. Mallard was also recorded at Ballinderry bog and along the Dungolman River. Flock sizes were from 1-12 birds. There were two incidental records of mallard from other surveys. These comprised 3 birds observed travelling during a breeding raptor survey in April 2019, and a mallard heard calling during a vantage point survey in November 2020.

4.2.3.2.5 *Tufted Duck*

Tufted duck was recorded during the winter season. Tufted duck was recorded 3 times during waterbird distribution surveys in the months of February and March. All observations were at Lough Sewdy and comprised a flock size of 2 birds.

4.2.3.2.6 *Lapwing*

Lapwing was recorded during the breeding and winter seasons. Lapwing was observed 17 times during vantage point surveys in the months of October, November, December, January and February over the 2 year survey period. These observations comprised flocks of between 1-150 birds travelling and circling within, or partially within, the Wind Farm Site. There were 7 observations of flocks landing in fields, of which 4 were within the Wind Farm Site and 3 were within 500m of the Wind Farm Site boundary. Four of these observations were from the same day in January 2020. Lapwing was observed 3 times during breeding walkover surveys. A single bird was heard calling in May 2020 within 500m of the Wind Farm Site. A flock of 20 birds was observed foraging within a field within the Wind Farm Site study area in June 2020, and a flock of 18 birds was observed roosting in the same field in July 2020. Lapwing was recorded twice during winter walkover surveys, in December 2019 and January 2021. Both observations were of birds foraging in fields within the Wind Farm Site. Flock size was between 6-24 birds. Lapwing was recorded 5 times during waterbird distribution surveys, in the months of October, November, January and February. All observations were at Lough Sewdy approximately 3.5km from the Wind Farm Site, and comprised birds in flight over the lake and surrounding farmland with flock sizes between 1-67 birds. There was one incidental record of lapwing during a vantage point survey in February 2021, comprising a flock of approximately 100 birds travelling outside of the viewshed area, approximately 1km from the Wind Farm Site.

4.2.3.2.7 *Black-headed Gull*

Black-headed gull was recorded during the breeding, passage and winter seasons. Black-headed gull were recorded 22 times during vantage point surveys during the months of January, February, April, June, July and August. All observations were within, or partially within, the Wind Farm Site. Flock sizes were between 1-210 birds and involved 860s at PCH. Birds were recorded circling, travelling and landing. There were 5 observations of flocks landing in fields, all of which were within the Wind Farm Site, comprising flocks of 21-75 birds. Black-headed gull was recorded once during breeding walkover surveys, comprising a single bird landing and foraging within 500m of the Wind Farm Site in June 2020. There was one observation of black-headed gull from waterbird distribution surveys, comprising a flock of 14 birds travelling over Lough Sewdy in February 2021. There was one incidental of black-headed gull from other surveys, comprising a single bird travelling during a breeding raptor survey in June 2020. There are 2 records of black-headed gull in the supplementary data, both from vantage point surveys in June 2019. The observations comprise flocks of 4 and 8 birds soaring and travelling.

4.2.3.3 Birds - Grid Connection

The Grid Connection onsite substation and temporary construction compound are located within the Wind Farm Site, and are located on lands made up of wet grassland, as detailed in Section 4.5.2.1.2 above

The underground electrical cabling route will commence from the proposed onsite substation and will run primarily along existing roads to the existing 110 kV Thornsberry substation in Co. Offaly. Required works are minor and are all located within the existing road corridor (see Section 3.2.6.7). For the Grid Connection underground electrical cabling route, the existing habitats (i.e. existing roads) do not have the potential to support other species of conservation interest in the area. On a precautionary basis, it is assumed that some temporary displacement may occur during works. However, given the extent of suitable habitat in the wider area, significant displacement effects are not predicted.

Map Legend

- EIAR Site Boundary

Polygon Habitats

- Arable crops
- Tilled land
- Buildings and artificial surfac
- Spoil and bare ground
- Recolonising bare ground
- Improved agricultural grassland
- Wet grassland
- Conifer plantation
- Oak-birch-holly woodland
- Oak-ash-hazel woodland
- Scrub
- Immature woodland
- Depositing/ Lowland Rivers
- Drainage Ditches
- Hedgerows
- Treelines

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Drawing Title

Habitat Map

Project Title	
Umma More Renewable Energy Development	
Drawn By: PE	Checked By: JH
Project No.: 201050	Drawing No.: Figure 4-1
Scale: 1:19,000	Date: 2023-02-14

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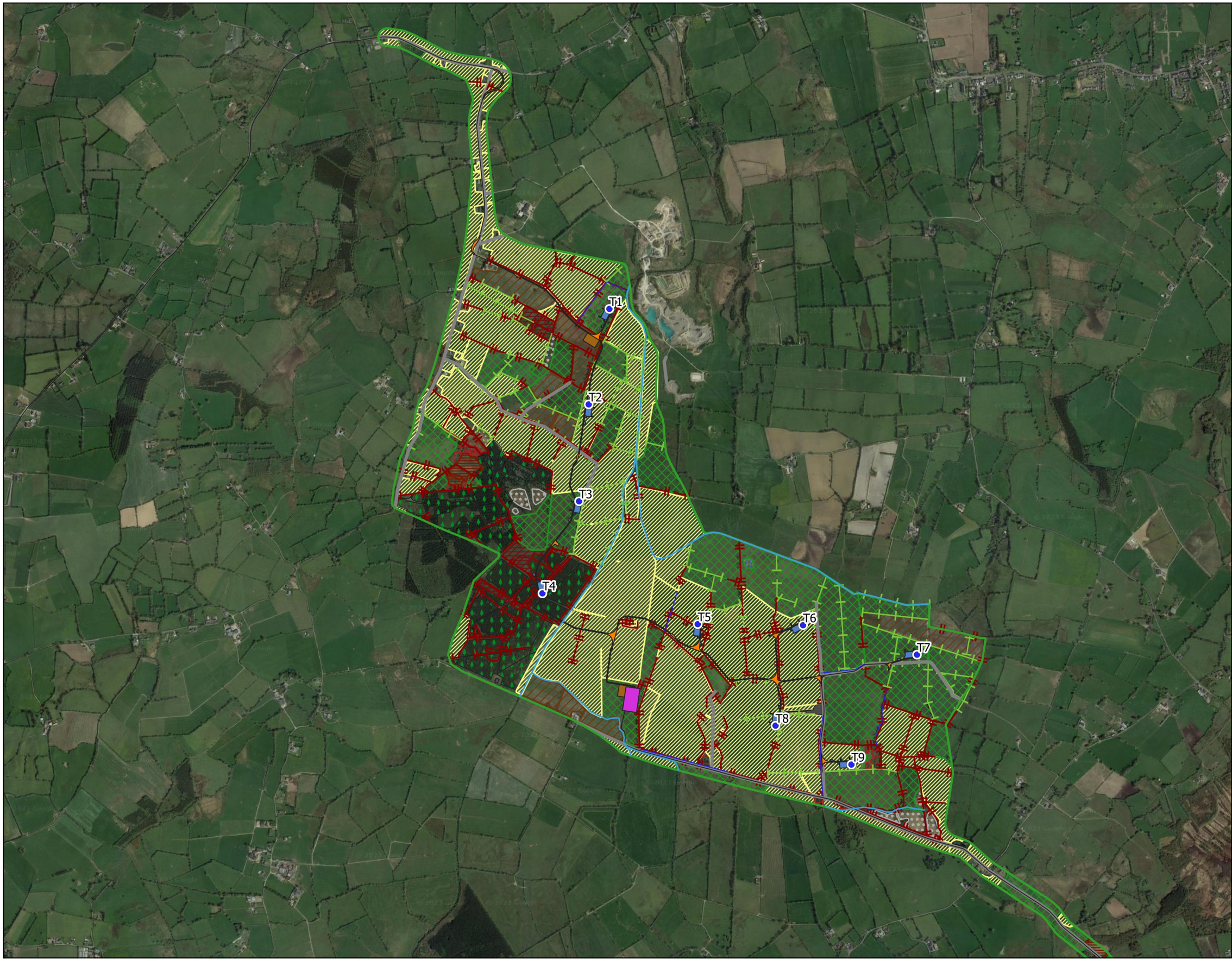

Map Legend

- EIAR Site Boundary

Polygon Habitats

- Arable crops
- Tilled land
- Buildings and artificial surfac
- Spoil and bare ground
- Recolonising bare ground
- Improved agricultural grassland
- Wet grassland
- Conifer plantation
- Oak-birch-holly woodland
- Oak-ash-hazel woodland
- Scrub
- Immature woodland
- Depositing/ Lowland Rivers
- Drainage Ditches
- Hedgerows
- Treelines
- Proposed Grid Connection V6
- Proposed Hardstands
- Proposed Met Mast
- Proposed New Roads
- Proposed Onsite Substation
- Proposed Temporary Construction Compounds
- Proposed Turbine Delivery Route
- Proposed Turbine Foundation
- Proposed Turbine Layout
- Proposed Upgrades to Existing Roads

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Drawing Title: Habitat Map with Proposed Wind Farm Site overlain

Project Title: Umma More Renewable Energy Development

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201050	Figure 4-2
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T1
T2
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Map Legend

EIAR Site Boundary

Feeding Remains

Spraint

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N

Drawing Title: Otter Signs

Project Title: Umma More Renewable Energy Development

Drawn By	Checked By
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201050	Figure 4-3
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4.3 Water

4.3.1 Regional and Local Hydrology

The information set out in this section describes the baseline hydrology of the site of the Proposed Development and the local area, and has been based on a detailed hydrological assessment carried out by Hydro-Environmental Services (HES) (provided in Appendix 2 of this NIS), and provides a baseline of the local watercourses within and downstream of the site of the Proposed Development. A summary of the assessment in relation to the hydrology of the Proposed Development site and connectivity European Sites is provided below.

The HES assessment describes the regional and local hydrology as follows:

> '*On a regional scale, the Wind Farm Site is located in the Inny River surface water sub-catchment, which is in the Upper Shannon catchment within Hydrometric Area 26 of the Irish River Basin District (SIRBD). The Inny River flows to the northwest approximately 8.2km northwest of the Wind Farm Site. The Inny River discharges into Lough Ree approximately 10.6km northwest of the Wind Farm Site.* (A regional hydrology map is shown as Figure 9-1 of the Hydrological Assessment, included as Appendix 2 to this NIS).
>
> *On a more local scale, the Wind Farm Site is located in the Inny River sub-catchment (Inny[Shannon]_SC_090) with the majority of the Wind Farm Site located in the Dungolman WFD river sub basin (Dungolman_030) (refer to Figure 9-2). A small section in the southwest of the Wind Farm Site is mapped in the Dungolman_020 river sub-basin while the northwestern corner of the Wind Farm Site is located in the Inny River (Inny_110) river sub-basin. However, none of the proposed turbines are mapped in the Dungolman_020 or Inny_110 river sub-basins.*
>
> *As stated above the majority of the Wind Farm Site is located in the Dungolman_030 river sub-basin. The Dungolman River (EPA Code: 26D06) flows to the northeast between T4 and T5. This watercourse then flows along the EIAR Site boundary to the east of T2 and T3 before veering to the northeast to the east of T1. Drainage in this river sub-basin is directed towards the Dungolman River via several smaller streams and drains. The Dungolman River continues to flow to the north before discharging into the Tang River (EPA Code: 26T02) approximately 5.15km north of the Wind Farm Site. The Tang River continues to flow to the northwest and eventually discharges into the Inny River (EPA Code: 26I01) approximately 8.3km northwest of the Wind Farm Site. The Inny River drains into the eastern side of Lough Ree.*
>
> *Within the Dungolman_020 River sub-basin, the southwest of the Wind Farm Site drains towards the Dungolman River via the Toorbeg stream (EPA Code: 26T25). Meanwhile within the Inny_110 River sub-basin, the northwest of the Wind Farm Site drains to the northwest via the Ardnacrany south stream (EPA Code: 26A50) which discharges into the Dungolman River approximately 4.3km north of the Wind Farm Site.*
>
> *The Grid Connection onsite 110kV substation and associated construction compound are located within the Wind Farm Site which is detailed above.*
>
> *The Grid Connection underground electrical cabling route is located within the Upper Shannon catchment (26) and Lower Shannon catchment (25A) of the Irish River basin district. A Grid Connection hydrology map is shown in Figure 9-3.*
>
> *The Grid Connection underground electrical cabling route is located within the Inny (Shannon) SC_090, the Brosna_SC_030, Brosna_SC_020, Silver[Tullamore]_SC_010 and Tullamore_SC_010 subcatchments. Apart from the Inny (Shannon) SC_090 subcatchment, all*

the associated subcatchment rivers flow generally southwest towards the Lower Shannon catchment. The primary watercourse within this Lower Shannon catchment (of the underground electrical cabling route) is the River Brosna. The Silver River and Tullamore River drain into the River Brosna.'

A local hydrology map is provided within the detailed hydrological assessment report (included as Appendix 2 to this NIS).

4.3.2 Hydrology in Relation to Screened-in European Sites

Section 9.3.11 of the detailed hydrology assessment (included as Appendix 2 to this NIS) assesses the potential for effects on European Sites as a result of a deterioration in water quality as a result of the Proposed Development. A summary of the assessment for screened-in European Sites for which hydrological connectivity to the Site has been identified.

Lough Ree SAC and SPA

Lough Ree SAC, SPA and pNHA is located approximately 10km northwest and downstream of the Wind Farm Site. This designated site is hydrologically linked with the Wind Farm Site via the Dungolman and Inny Rivers.

On a regional scale, the Wind Farm Site is located in the Inny River surface water sub-catchment, which is in the Upper Shannon catchment within Hydrometric Area 26 of the Irish River Basin District (SIRBD). The Inny River flows to the northwest approximately 8.2km northwest of the Wind Farm Site. The Inny River discharges into Lough Ree approximately 10.6km northwest of the Wind Farm Site.

The majority of the Wind Farm Site is located in the Dungolman_030 river sub-basin. The Dungolman River (EPA Code: 26D06) flows to the northeast between T4 and T5. This watercourse then flows along the Site boundary to the east of T2 and T3 before veering to the northeast to the east of T1. Drainage in this river sub-basin is directed towards the Dungolman River via several smaller streams and drains. The Dungolman River continues to flow to the north before discharging into the Tang River (EPA Code: 26T02) approximately 5.15km north of the Wind Farm Site. The Tang River continues to flow to the northwest and eventually discharges into the Inny River (EPA Code: 26I01) approximately 8.3km northwest of the Wind Farm Site. The Inny River drains into the eastern side of Lough Ree.

River Shannon Callows SAC and Middle Shannon Callows SPA

The River Shannon Callows SAC and SPA are situated approximately 14.7km to the southwest of the Wind Farm Site at their closest point. The only potential pathway to the River Shannon Callows SAC is via surface water pathways along the Grid Connection underground cable route; the Silver [Tullamore]_030 watercourse crossed by the route ultimately flows to the River Shannon, a total hydrological distance of approximately 38km.

5. EUROPEAN SITES

5.1 Determination of Qualifying Interests/ Special Conservation Interests for Further Assessment

The European sites described in the following sections have been screened in for further assessment where the potential for likely significant effects on them as a result of the Proposed Development cannot be excluded (see AA Screening Report, provided as Appendix 1 of this NIS). The following sections consider the individual Qualifying Interests (QIs) (for SACs) and Special Conservation Interest (SCI) features (for SPAs) of each site, and identify those for which there is a potential pathway for effect and those for which the potential for likely significant effects can be excluded.

5.1.1 Lough Ree SAC [000440]

The individual pathways for effects that were identified in Table 3-1 of the AA Screening Report (Appendix 1) are summarised below.

There is no potential for direct effects on any QIs of the SAC given that the Proposed Development is located entirely outside of this designated site and no pathways for effects in relation to direct impacts have been identified in the AA Screening Report.

Due to the intervening distance and the nature of the Proposed Development works, including those along the Grid Connection underground electrical cabling route, there is no potential for indirect effects to the following terrestrial, rain-fed QI habitat for which this SAC is designated:

- [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites
- [7110] Active raised bogs
- [7120] Degraded raised bogs still capable of natural regeneration
- [8240] Limestone pavements
- [91D0] Bog woodland
- [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

The Proposed Development site is within the same sub-catchment to the SAC. Given the potential surface water connectivity between the Proposed Development and the SAC via the Dungolman_030 watercourse, as identified in the AA Screening Report and the hydrological assessment (see Appendices 1 and 2 respectively), likely significant effects on the following aquatic and semi-aquatic QI habitats and species (resulting from a deterioration in water quality from the potential release of pollutants during site works via hydrological pathways) cannot be ruled out.

Due to the proximity of the SAC to the Site, and taking a precautionary approach, a potential pathway for indirect effects on the following aquatic dependent QI was identified in the form of water quality deterioration:

- [3150] Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation 7120]
- [7230] Alkaline fens
- [1355] Otter *Lutra lutra*

5.1.2 River Shannon Callows SAC [000216]

The individual pathways for effects that were identified in Table 3-1 of the AA Screening Report (Appendix 1) are summarised below.

There is no potential for direct effects on any QIs of the SAC given that the Proposed Development is located entirely outside of this designated site and no pathways for effects in relation to direct impacts have been identified in the AA Screening Report.

Due to the intervening distance and the nature of the Proposed Development works, including those along the underground electrical cabling route, there is no potential for indirect effects to the following terrestrial QI habitat for which this SAC is designated:

- [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- [6510] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)
- [8240] Limestone Pavements

The Proposed Development site is hydrologically connected to the downstream SAC. Given the potential for surface water connectivity between the Proposed Development and the SAC, as identified in the AA Screening Report likely significant effects on the following aquatic dependant habitat (resulting from a deterioration in water quality from the potential release of pollutants during site works via groundwater pathways) cannot be ruled out.

Taking a precautionary approach, a potential pathway for indirect effects on the following aquatic dependent QI was identified in the form of water quality deterioration:

- [1355] Otter (*Lutra lutra*)
- [7230] Alkaline fens
- [91E0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Taking a precautionary approach, due to the fact that otter can potentially occupy large territories as large as 20 linear km along a watercourse, the potential for direct and indirect disturbance/ displacement of Otter also requires further consideration.

5.1.3 Lough Ree SPA [004064]

The individual pathways for effect that were identified in Table 3-1 of the AA Screening Report (Appendix 1) are summarised below.

There will be no direct effects to SCI species from habitat loss or damage as the Proposed Development is located entirely outside the designated site.

The Wind Farm Site is located outside the potential foraging range of SCI species associated with the SPA (SNH, 2016; Johnson et al., 2014). It is also located outside the zone of sensitivity of any species that is listed as particularly sensitive to wind energy development in Mc Guinness et al. (2015).

A potential pathway for deterioration of water quality was identified within the AASR (see Appendix 1), which may result in adverse effects on the following SCI in the absence of mitigation:

- Wetland and Waterbirds [A999]

Further assessment is also required for the supporting wetland habitat in relation to effects on water quality, reduction in volume or change in flow path.

5.1.4 Middle Shannon Callows SPA [00]

The individual pathways for effect that were identified in Table 3-1 of the AA Screening Report (Appendix 1) are summarised below.

There will be no direct effects to SCI species from habitat loss or damage as the Proposed Development is located entirely outside the designated site.

The Wind Farm Site is located outside the potential foraging range of SCI species associated with the SPA (SNH, 2016; Johnson et al., 2014) It is also located outside the zone of sensitivity of any species that is listed as particularly sensitive to wind energy development in Mc Guinness et al. (2015).

A potential pathway for deterioration of water quality was identified within the AASR (see Appendix 1), which may result in adverse effects on the following SCI in the absence of mitigation:

- Wetland and Waterbirds [A999]

Further assessment is required for the supporting wetland habitat in relation to effects on water quality, reduction in volume or change in flow path.

5.2 Desk Study – European Sites

The desk study undertaken for this assessment included a thorough review of the available ecological data associated with the Site Boundary. Sources of data included the following:

- Review of NPWS Conservation Objectives supporting documents, site synopsis, standard data forms and supporting documents for EU Designated Sites (provided as Appendix 9)
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA),
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper,
- Inland Fisheries Ireland (IFI) reports, where relevant/available,
- Review of 2019, 2013 and 2007 EU Habitats Directive (Article 17 & Article 12) Reports and associated metadata[3,4].

5.2.1 Lough Ree SAC [000440]

The relevant QIs and the associated conservation objectives of the site are presented in Table 5-1. The Targets and Attributes for the relevant habitats and species, as described in the Lough Ree SAC Conservation Objectives supporting documents, were reviewed and considered in this assessment.

[3] *Status of Habitats and Species - Article 17 Reports, Online, Available at: https://www.npws.ie/publications/article-17-reports Accessed 19.09.2020*
[4] *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 19.09.2020*

5.2.1.1 Review of conservation objectives

The relevant QIs and the associated conservation objectives are presented in Table 5-1.

Table 5-1Qualifying Interests and Conservation Objectives (Version 1, August 2016[5])

Qualifying Interest	Conservation Objective
[3150] Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation	To restore the favourable conservation condition of Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation in Lough Ree SAC.
[7230] Alkaline fens	To maintain the favourable conservation condition of Alkaline fens in Lough Ree SAC
[1355] Otter *Lutra lutra*	To maintain the favourable conservation condition of Otter in Lough Ree SAC

5.2.1.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SAC were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-2 and Table 5-3.

[5] *NPWS (2016) Conservation objectives for Lough Ree SAC [000440]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

Table 5-2 Site-specific threats, pressures, and activities – Negative Impacts

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside/Both (I / O/ B)
	Code	Description	
M	A03.03	Abandonment/ Lack of Mowing	I
M	A04	Grazing	I
M	A08	Fertilisation	B
M	B02	Forest and Plantation Management and Use	B
L	D03.01.02	Piers / Tourist Harbours Or Recreational Piers	I
M	E01.03	Dispersed Habitation	O
M	F02.03	Leisure Fishing	I
M	F03.01	Hunting	I
M	G01.01	Nautical Sports	I
L	G01.02	Walking, Horseriding And Non-Motorised Vehicles	I
M	H01.08	Diffuse Pollution To Surface Waters Due To Household Sewage And Waste Waters	B
M	H02.06	Diffuse Groundwater Pollution Due To Non-Sewered Population	B
L	H06.03	Thermal Heating Of Water Bodies	O
H	I01	Invasive Non-Native Species	B
L	J02.04	Flooding Modifications	B
H	J02.11.02	Other Siltation Rate Changes	O
H	K03.05	Antagonism Arising From Introduction Of Species	I
L	L08	Inundation (Natural Processes)	I

L = Low, M = Medium, H = High, I = Inside, O = Outside

L = Low, M = Medium, H = High, I = Inside, O = Outside

Potential pathways for effect with regard to site-specific threats, pressures and activities have been identified in relation to potential for pollution i.e. Diffuse Pollution To Surface Waters Due To Household Sewage And Waste Waters *(H01.08)* and *Other Siltation Rate Changes (J02.11.02)* to the site-specific threats, pressures and activities were identified. No pathways for impact with regard to any

additional site-specific threats, pressures and activities were identified. The potential for impacts is assessed further in Section 6.

5.2.1.1 Qualifying Interests

5.2.1.1.1 *[1355] Otter (Lutra lutra)*

The distribution of this species within the SAC is illustrated on Map 5 of the site-specific conservation objective document (NPWS 2016). According to the site-specific conservation objectives (NPWS, 2016), measure was based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-east estimated at 93.6% (Reid *et al.,* 2013).

5.2.1.1.2 *[3150] Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation*

The distribution of this habitat and barriers to connectivity is illustrated on Map 9 of the site-specific conservation objective document (NPWS 2016). According to the site-specific conservation objectives (NPWS, 2016) the extent of the habitat area within the Lough Ree SAC is considered to occur in Lough Ree, Killinure Lough, Coosan Lough and Ballaghkeeran Bay.

5.2.1.1.3 *[7230] Alkaline Fens*

According to the site-specific conservation objectives (NPWS, 2016) the full extent of the habitat area within the Lough Ree SAC is currently unknown. The main area is considered to occur in the vicinity of St. John's Wood, on the western side of the lake but there are likely to be additional areas around the lake.

5.2.2 River Shannon Callows SAC [000216]

The relevant QIs and the associated conservation objectives of the site are presented in Table 5-4. The Targets and Attributes for the relevant habitats and species, as described in the River Shannon Callows SAC Conservation Objectives supporting documents, were reviewed and considered in this assessment.

5.2.2.1 Review of conservation objectives

The relevant QIs, as brought forward in Section 5.1 and the associated conservation objectives are presented in Table 5-4 below. The Targets and Attributes for the relevant habitats and species, as described in the River Shannon Callows SAC Conservation Objectives documents (NPWS, Version 1, January 2022), were reviewed and considered in this assessment.

Table 5-3 Qualifying Interests and Conservation Objectives (Version 1, January 2022[6])

Qualifying Interest	Conservation Objective
[91E0] Alluvial forests with *Alnus glutinosea* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*	To maintain the favourable conservation condition of Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* in River Shannon Callows SAC
[7230] Alkaline fens	To maintain the favourable conservation condition of Alkaline fens in River Shannon Callows SAC
[1355] Otter *Lutra lutra*	To maintain the favourable conservation condition of Otter (*Lutra lutra*) in River Shannon Callows SAC.

5.2.2.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SAC were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-5 and Table 5-6.

[6] *NPWS (2022) Conservation Objectives: River Shannon Callows SAC 000216. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage*

Table 5-4: Site-specific threats, pressures, and activities – Negative Impacts

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside/Both (I / O/ B)
	Code	Description	
H	A03.03	Abandonment/ Lack of Mowing	I
H	A.04.03	Abandonment of pastoral systems, lack of grazing	I
H	A07	use of biocides, hormones and chemicals	I
H	J02.04.01	Flooding	I
L	A04.02.05	non intensive mixed animal grazing	I
L	A10.01	Removal of hedges and copses or scrub	I
L	B06	grazing in forests/ woodland	I
L	C01.03.02	mechanical removal of peat	I
L	D01.01	paths, tracks, cycling tracks	I
L	F03.01	Hunting	B
L	G01	Outdoor sports and leisure activities, recreational activities	I
L	G05.01	Trampling, overuse	I
L	J02.01	Landfill, land reclamation and drying out, general	I
L	J02.05	Modification of hydrographic functioning, general	I
M	A04.01	intensive grazing	I
M	A08	Fertilisation	I
M	B02.02	forestry clearance	I
M	J02.05.02	modifying structures of inland water courses	I
M	J02.11	Siltation rate changes, dumping, depositing of dredged deposits	I
M	K03.04	predation	B

L = Low, M = Medium, H = High, I = Inside, O = Outside

Table 5-5 Site-specific threats, pressures, and activities – Positive Impacts

Positive Impacts			
Rank	Threats and Pressures		Inside/Outside/Both (I / O/ B)
	Code	Description	
H	A03	Mowing/cutting of grass	I
L	J02.05	Modification of hydrographic functioning, general	I

L = Low, M = Medium, H = High, I = Inside, O = Outside

Potential pathways for effect with regard to site-specific threats, pressures and activities have been identified in relation to potential for pollution *i.e.* Siltation rate changes, dumping, depositing of dredged deposits (J02.11) to the site-specific threats, pressures and activities were identified. No pathways for impact with regard to any additional site-specific threats, pressures and activities were identified to the site-specific threats, pressures and activities were identified. The potential for impacts is assessed further in Section 6.

5.2.2.3 Qualifying Interests

The following relevant information has been extracted from the NPWS site synopsis and Natura 2000 Data Form for the SPA on the 13/01/2023:

5.2.2.3.1 *[1355] Otter (Lutra lutra)*

According to the site specific conservation objectives (NPWS, 2022), measure is based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)

5.2.2.3.2 *[91E0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

According to the site specific conservation objectives (NPWS, 2022), alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* is present in River Shannon Callows SAC. Alluvial woodland has been identified at numerous locations along the Shannon from the islands below the ESB weir at Meelick to Madden's Island upstream. A small area of Alluvial woodland (1.1ha) has been mapped on two river islands at Madden's Island (Martin and Brophy, 2017). However, with the exception of Madden's Island, the habitat has not been mapped in detail and thus the current total habitat area within the SAC is unknown. The habitat is found on riverbanks and alluvial islands which are prone to periodic flooding (NPWS internal files). It is important to note that further areas of the habitat may be present elsewhere within the SAC and other documented areas of wet woodland, e.g. around Bishop's Island, Banagher and Clonburren (NPWS internal files), may also correspond to this priority Annex I woodland type. Distribution based on Martin and Brophy (2017). See the notes on habitat area in the site-specific conservation objectives document (NPWS, 2022). It is important to note that further unsurveyed areas may be present within the SAC.

5.2.2.3.3 *[7230] Alkaline Fens*

According to the site-specific conservation objectives (NPWS, 2016) the full extent of the habitat area within the Middle Shannon Callows SAC occurs south of Portumna Bridge and south-east of the town of Portumna in an area of low-lying terrestrial land west of the river. The fen area corresponds largely to a former small bay at the northern end of Lough Derg that was cut off from the lake when the embankment was originally constructed as part of the Shannon Hydroelectric Scheme in the late 1920s. The area of alkaline fen in the SAC has been mapped as c.15ha based on Heery and Mayes (2012). See map 4 of the site-specific conservation objectives (NPWS, 2022). It is important to note that further surveyed areas of the habitat may be present within the SAC. Habitat distribution based on Heery and Mayes (2012). See map 4 of the site-specific conservation objectives (NPWS, 2022). It is important to note that further surveyed areas of the habitat may be present within the SAC

5.2.3 Lough Ree SPA [004064]

The relevant QIs and the associated conservation objectives of the site are presented in Table 5-10. The Targets and Attributes for the relevant habitats and species, as described in the Lough Ree SPA Conservation Objectives supporting documents, were reviewed and considered in this assessment.

The following aquatic and groundwater influenced SCI species has the potential to be affected through the deterioration of groundwater via the percolation of polluting materials through the dark limestone, shale and unbedded lime-mudstone bedrock underlying the site. Pollution of groundwater may result in adverse impacts on the following designation covering the supporting wetland habitat of the SPA in the absence of mitigation:

- Wetlands and waterbirds [A999]

5.2.3.1 Review of Conservation Objectives for Lough Ree SPA

The relevant SCI and the associated conservation objective are presented in Table 5-10. The target and attributes for this species, as described in the First Order Site-specific Conservation Objectives document, were reviewed and considered for potential effects in this assessment.

Table 5-6 Qualifying Interests and Conservation Objectives (First Order Site-Specific Conservation Objectives, November 2022[7])

Special Conservation Interest (SCI)	Conservation Objective
Wetlands and waterbirds [A999]	*'To maintain or restore the favourable conservation condition of the wetland habitat at Lough Ree SPA as a resource for the regularly-occurring migratory waterbirds that utilise it..'*

5.2.3.1 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-11 and Table 5-12.

[7] *NPWS (2022) Conservation objectives for Lough Ree SPA [004064]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage..*

Table 5-7 Site-specific threats, pressures and activities – Negative Impacts

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside/Both (I / O/ B)
	Code	Description	
M	A04	Grazing	O
M	A08	Fertilisation	O
L	B	Sylviculture, Forestry	O
M	F02.03	Leisure Fishing	I
M	F03.01	Hunting	I
H	G01.01	Nautical Sports	I
M	G01.02	Walking, Horse riding and Non-Motorised Vehicles	O
M	I01	Invasive Non-Native Species	I

L = Low, M = Medium, H = High, I = Inside, O = Outside

No pathways for impact with the site-specific threats, pressures and activities were identified. No pathways for impact with regard to any additional site-specific threats, pressures and activities were identified.

The screening assessment of the Proposed Development identified potential for water pollution associated with the construction phase and decommissioning phase of the Proposed Development.

5.2.3.1 Special Conservation Interests

The following relevant information has been extracted from the NPWS site synopsis and Natura 2000 Data Form for the SPA on the 08/02/2023:

5.2.3.1.1 *[A999] Wetland and Waterbirds*

According to the site-specific conservation objectives the extent of wetland habitat within the SPA was estimated as 12348ha using OSi data and relevant orthophotographs (NPWS, 2022). The following relevant extracts have been gleaned from the NPWS site synopsis and Natura 2000 Data Form from the SPA.

"*Situated on the River Shannon between Lanesborough and Athlone, Lough Ree is the third largest lake in the Republic of Ireland. It lies in an ice-deepened depression in Carboniferous Limestone. Some of its features (including the islands) are based on glacial drift. The main inflowing rivers are the Shannon, Inny and Hind, and the main outflowing river is the Shannon. The greater part of Lough Ree is less than 10 m in depth, but there are six deep troughs running from north to south, reaching a maximum depth of about 36 m just west of Inchmore. The lake has a very long, indented shoreline and hence has many sheltered bays. It also has a good scattering of islands, most of which are included in the site.*

Beds of Common Reed (Phragmites australis) are an extensive habitat in a number of the more sheltered places around the lake; monodominant stands of Common Clubrush (Scirpus lacustris), Slender Sedge (Carex lasiocarpa) and Saw Sedge (Cladium mariscus) also occur as swamps in suitable places. Some of these grade into speciesrich calcareous fen or freshwater marsh. Lowland wet grassland, some of which floods in winter, occurs frequently around the shore.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Whooper Swan, Wigeon, Teal, Mallard, Shoveler, Tufted Duck, Common Scoter, Goldeneye, Little Grebe, Coot, Golden Plover, Lapwing and Common Tern. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Lough Ree is one of the most important Midland sites for wintering waterfowl, with nationally important populations of Little Grebe (52), Whooper Swan (139), Wigeon (2,070), Teal (1,474), Mallard (1,087), Shoveler (54), Tufted Duck (1,012), Goldeneye (205), Coot (338), Golden Plover (3,058) and Lapwing (5,793) – all figures are three year mean peaks for the period 1997/98 to 1999/2000. Other species which occur in winter include Great Crested Grebe (29), Cormorant (99), Curlew (254) and Black-headed Gull (307) as well as the resident Mute Swan (85). Greenland White-fronted Goose has been recorded on occasion on the flooded margins of the site.

The site supports a nationally important population of Common Tern (90 pairs in 1995). It is a traditional breeding site for Black-headed Gull and whilst a full survey has not been carried out in recent years, substantial numbers of nesting birds were present on at least one island in 2003. Lesser Black-backed Gull and Common Gull have bred in the past and may still breed. Lough Ree is a noted site for breeding duck and grebes: Tufted Duck (202 pairs) and Great Crested Grebe (32 pairs) – records from 1995. Of particular note is that Lough Ree is one of the two main sites in the country for breeding Common Scoter, a Red Data Book species. Surveys have recorded 39 pairs and 32 pairs in 1995 and 1999 respectively. Cormorant also breeds on some of the islands within the site – 86 nests were recorded in 2010. The woodland around the lake is a stronghold for Garden Warbler and this scarce species probably occurs on some of the islands within the site.

Lough Ree SPA is of high ornithological importance for both wintering and breeding birds. It supports nationally important populations of eleven wintering waterfowl species. The site has a range of breeding waterfowl species, notably nationally important populations of Common Scoter and Common Tern. Of particular note is the regular presence of three species, Whooper Swan, Golden Plover and Common Tern, which are listed on Annex I of the E.U. Birds Directive. Parts of Lough Ree SPA are Wildfowl Sanctuaries."

5.2.4 Middle Shannon Callows SPA [004096]

The relevant QIs and the associated conservation objectives of the site are presented in Table 5-10. The Targets and Attributes for the relevant habitats and species, as described in the Middle Shannon Callows SPA Conservation Objectives supporting documents, were reviewed and considered in this assessment.

The following aquatic influenced SCI species has the potential to be affected through the deterioration of waters via the percolation of polluting materials via surface waters. Pollution of surface water may result in adverse impacts on the following designation covering the supporting wetland habitat of the SPA in the absence of mitigation:

- Wetlands and waterbirds [A999]

5.2.4.1 Review of Conservation Objectives for Middle Shannon Callows SPA

The relevant SCI and the associated conservation objective are presented in Table 5-10. The target and attributes for this species, as described in the First Order Site-specific Conservation Objectives document, were reviewed and considered for potential effects in this assessment.

Table 5-8 Qualifying Interests and Conservation Objectives (Version 1, November 2022[8])

Special Conservation Interest (SCI)	Conservation Objective
Wetlands and waterbirds [A999]	*'To maintain the favourable conservation condition of wetlands in Middle Shannon Callows SPA'*

5.2.4.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-11 and Table 5-12.

[8] *NPWS (2022) Conservation Objectives: Middle Shannon Callows SPA 004096. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.*

Table 5-9 Site-specific threats, pressures and activities – Negative Impacts

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside/Both (I / O/ B)
	Code	Description	
L	A04.03	abandonment of pastoral systems, lack of grazing	I
H	A04	grazing	I
H	E01	Urbanised areas, human habitation	O
L	D01.01	paths, tracks, cycling tracks	I
H	D01.05	bridge, viaduct	I
H	G01.01	nautical sports	I
M	A08	Fertilisation	O
L	A08	Fertilisation	I
M	G01.02	walking, horseriding and non-motorised vehicles	I
L	F03.01	Hunting	I
M	F02.03	Leisure fishing	I

L = Low, M = Medium, H = High, I = Inside, O = Outside

No pathways for impact with the site-specific threats, pressures and activities were identified. No pathways for impact with regard to any additional site-specific threats, pressures and activities were identified.

The screening assessment of the Proposed Development identified potential for water pollution associated with the construction phase and decommissioning phase of the Proposed Development.

5.2.4.3 Special Conservation Interests

The following relevant information has been extracted from the NPWS site synopsis and Natura 2000 Data Form for the SPA on the 08/02/2023:

5.2.4.3.1 *[A999] Wetland and Waterbirds*

According to the site-specific conservation objectives of the wetland habitat area within the SPA, any significant loss to the wetland habitat within the SPA would likely significantly negatively impact the regularly-occurring migratory waterbirds that utilise this wetland habitat. Such loss of wetland habitat would likely reduce the diversity and abundance of waterbird species that the wetland can support. This, in turn, could negatively impact the Conservation Objectives for waterbird species listed as Special Conservation Interests in the SPA or other regularly-occurring migratory waterbird species The

following relevant extracts have been gleaned from the NPWS site synopsis and Natura 2000 Data Form from the SPA.

"The Middle Shannon Callows SPA is a long and diverse site which extends for approximately 50 km from the town of Athlone to the town of Portumna; it lies within Counties Galway, Roscommon, Westmeath, Offaly and Tipperary. The site averages about 0.75 km in width though in places is up to 1.5 km wide. Water levels on the site are greatly influenced by the very small fall between Athlone and Portumna and by the weir at Meelick. The site has extensive areas of callow, or seasonally flooded, semi-natural, lowland wet grassland, along both sides of the river. The callows are mainly too soft for intensive farming but are used for hay or silage or for summer grazing. Other habitats of smaller area which occur alongside the river include lowland dry grassland, freshwater marshes, reedbeds and wet woodland. The diversity of semi-natural habitats present and the sheer size of the site attract an excellent diversity of bird species, including significant populations of several.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Whooper Swan, Wigeon, Corncrake, Golden Plover, Lapwing, Black-tailed Godwit and Black-Headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The Middle Shannon Callows qualifies as a site of international importance as it regularly supports in excess of 20,000 wintering waterbirds (23,656 – four year mean peak for four of the winters between 1995/96 and 1999/2000). The site also supports internationally important populations of Whooper Swan (305 – five year mean peak for the period 1995/96 to 1999/2000) and Black-tailed Godwit (485 – four year mean peak for four of the winters between 1995/96 and 1999/2000). Four further species of wintering waterbird occur in numbers of national importance, i.e. Wigeon (3,059), Golden Plover (4,133) , Lapwing (13,240) and Black-headed Gull (1,209) – all figures are four year mean peaks for four of the winters between 1995/96 and 1999/2000.

The Shannon Callows is the largest site monitored as part of I-WeBS and many parts of it are inaccessible on the ground. Annual monitoring of the wintering waterbirds of the Shannon Callows is undertaken by aerial surveys in January/February with some areas also covered by ground counts. The importance of the site for some species may have been underestimated if count coverage missed the brief spring peaks for these species, e.g. peak counts of Lapwing (23,409) and Black-tailed Godwit (1,096) recorded in the baseline period (1995/96 to 1999/2000) have been considerably higher than the four year means. . A wide range of other species occurs within the site, including Mute Swan (407), Teal (88), Tufted Duck (41), Dunlin (335), Curlew (162) and Redshank (39). Small numbers of Greenland White-fronted Goose use the Shannon Callows (peak 55 in 1998/99) and these are generally associated with larger flocks which occur on the adjacent Little Brosna Callows and River Suck Callows. The callow grasslands provide optimum feeding grounds for these various species of waterfowl, while many of the birds also roost or rest within the site.

The Shannon Callows is also an important site for breeding waders with the total population on the Shannon and Little Brosna Callows being one of three major concentrations in Ireland and Britain in 1987. Numbers of some species have declined since then but a survey of the Shannon Callows in 2002 recorded the following breeding waders - Lapwing (63 pairs), Redshank (116 pairs), Snipe (139 drumming birds) and Curlew (8 pairs). Black-tailed Godwit, a very rare breeding species in Ireland, nests or attempts to nest in small numbers each year within the site. A further scarce breeding species, Shoveler, also nests in small numbers each year (an estimated 12 pairs in 1987).

The Middle Shannon Callows SPA supports a breeding population of Corncrake (19 pairs - five year mean peak between 2003 and 2007, based on records of calling males).

Corncrake winter in southern and eastern Africa, migrating northwards to arrive on their breeding grounds from early April onwards, departing again in August and September. They require the cover of tall vegetation throughout their breeding cycle and are strongly associated with meadows which are harvested annually, where they nest and feed. Annual cutting of these meadows creates a sward which is easy for the birds to move through. Other habitats, which can provide cover for Corncrake in the early and late stages of the breeding season, are also important for this species.

Corncrake is listed on the 2010 International Union for Conservation of Nature (IUCN) Red List of Threatened Species. This is due to population and range declines of more than 50% in the last 25 years across significant parts of its range.

Quail, a related, scarce species, is also known to breed within the callow grasslands.

A good variety of other bird species are attracted to the site. Birds of prey, including scarce species such as Merlin and wintering Hen Harrier have been recorded hunting over the callows. A range of passerine species associated with grassland and swamp vegetation breed, including Sedge Warbler, Grasshopper Warbler, Skylark and Reed Bunting. Kingfisher is also known to occur within the site. Whinchat, an uncommon breeding species, occurs in small numbers.

The Middle Shannon Callows SPA is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. It holds internationally important populations of two species - Whooper Swan and Black-tailed Godwit. In addition, there are four species that have wintering populations of national importance. The site also supports a nationally important breeding population of Corncrake. Of particular note is that several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Corncrake and Golden Plover."

6. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

This section of the NIS assesses the potential effects of the Proposed Development on the identified relevant Qualifying Interests/Special Conservation Interests. This assessment is undertaken in the absence of any mitigation and in respect of the conservation objectives of the European Sites. The Conservation Objectives for each of the European Sites assessed were reviewed on the 29/09/2022 and 13.01.2023. The Conservation Objectives for these sites are available at the following locations:

- Lough Ree SAC (https://www.npws.ie/protected-sites/sac/000440)
- Middle Shannon Callows SAC (https://www.npws.ie/protected-sites/sac/000216)
- Lough Ree SPA (https://www.npws.ie/protected-sites/spa/004064)
- Middle Shannon Callows SAC (https://www.npws.ie/protected-sites/spa/004096)

Following the initial impact assessment, mitigation is prescribed where necessary to avoid adverse effects on the Conservation Objectives of the relevant QIs/SCIs.

6.1 Potential for Direct Effects on the European Sites

The Proposed Development site lies entirely outside of the boundary of any European Site and as such there is no potential for direct effects on the Qualifying Interests of the Lough Ree SAC, River Shannon Callows SAC, Lough Ree SPA or Middle Shannon Callows SPA relating to land take.

6.1.1 Disturbance and Displacement of Otter

Due to the use of the riparian habitat within the Proposed Development site by otter the potential for disturbance to the Otter population associated with the following SACs is considered below:

- Lough Ree SAC
- River Shannon Callows SAC

Otter are crepuscular in nature and are unlikely to be adversely impacted by the Proposed Development 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 Proposed Development design and are described in Section 6.3.1 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 Lough Ree and Middle Shannon Callows SACs can be excluded.

No disturbance related impacts on otter are therefore anticipated; nonetheless mitigation for the species has been specified on a precautionary basis.

6.2 Potential for Indirect Effects on the European Sites

6.2.1 Deterioration in water quality

There is hydrological connectivity between the Proposed Development and downstream European Sites via watercourses within the Proposed Development site boundary.

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

Lough Ree SAC

- [1355] Otter (*Lutra lutra*)
- [3150] Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation
- [7230] Alkaline fens

River Shannon Callows SAC

- [1355] Otter (*Lutra lutra*)
- [7230] Alkaline fens
- [91E0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Lough Ree SPA

- [A999] Wetland and Waterbirds

Middle Shannon Callows SPA

- [A999] Wetland and Waterbirds

6.3 Mitigation

6.3.1 Disturbance to Otter

Taking a precautionary approach, a potential pathway for indirect effects on otter associated with Lough Ree and River Shannon Callows SACs has been identified as a result of disturbance associated with the construction, operation and decommissioning phase of the Proposed Development works.

6.3.1.1 Best Practice Preventive Measures

Signs of otter i.e. spraints and feeding remains, were recorded at one location along the Dungolman watercourse within the Wind Farm Site (see Figure 4-3). However no potential otter holts were recorded within the Wind Farm Site or along the Grid Connection. Given the presence of otter in the vicinity of the Proposed Development and from a precautionary perspective, best practice measures have been incorporated into the Proposed Development works in order to avoid or minimise any potential for indirect effect on the species.

Within the Wind Farm Site, turbine locations have been selected to avoid natural watercourses (located over 50 metres from EPA mapped watercourses). There is one clear-span watercourse crossing proposed, along with culvert crossings of artificial drains within the Wind Farm Site. The construction methodology for the 11 no. EPA/OSI mapped crossings has been designed to eliminate the requirement for in-stream works on these locations requiring a crossing to be constructed to traverse the watercourse with the cabling ducts. There is no potential for the Proposed Development to result in any barrier to the movement of otter.

6.3.1.1.1 *Pre-Construction Otter Survey*

From a highly precautionary perspective, prior to any works being carried out, a pre-construction Otter survey, as per the methodology detailed in Section 4.1.3.1, will be undertaken by a qualified ecologist to ensure that Otter has not taken up residence within or close to the proposed works area.

In the unlikely event that a holt is identified that could be potentially impacted during the pre-construction surveys, the need for additional mitigation will be assessed with reference to the procedures as outlined in the TII/NRA guidelines (2006), and in consultation with the National Parks and Wildlife Service (NPWS). Where works risk impacting an otter holt, these works will only be carried out under a derogation licence from NPWS, and all conditions of a derogation licence will be implemented in full.

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.

6.3.2 Mitigation by Design

The design of the Proposed Development, as described in Section 3 of this NIS and in the CEMP, (see Appendix 3), sets out clearly how the Proposed Development 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 negative 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 Proposed 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:

- All major infrastructure such as turbines, meteorological mast, onsite substation and temporary construction compounds will be over 50m from any main watercourse (identified on EPA watercourse mapper) and 10m from any large drainage channels on the Site.
- All of the key development components within the Wind Farm Site are located significantly away from the delineated 50m watercourse buffer zones, with the exception of the upgrading of the existing watercourse crossing, new drain crossing and upgrades to existing site tracks. Spoil management areas for removed soil/subsoil will be localised to spoil management areas outside of these buffer zones and will be designed and constructed with the minimal amount of surface area exposed. In these spoil management areas, the vegetative top-soil layer will be removed and re-instated where applicable. In certain areas where reinstated of the vegetative top-soil layer is not possible, these areas will be reseeded directly after construction, allowing for rapid re-vegetation which will mitigate against erosion. Additional control measures, outlined further below, will be undertaken at the proposed watercourse and drain crossing locations.
- The access road on the approach either side of the watercourse 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. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse 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 and will be lifted into place from the bank with no contact with the watercourse.
- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse,
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

The watercourse crossing 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 the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

6.3.2.1 Morphological Changes to Surface Watercourses and Drainage Patterns

Diversion, culverting, road and cabling crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over watercourses has the potential to significantly interfere with water quality and flows during the construction phase.

It is proposed that 1 no. new watercourse crossing will be required to facilitate the access roads within the Wind Farm Site. This crossing is further described in Section 3.2.

Along sections of proposed and existing access roads, the internal electrical cabling will be constructed within the road crossing. Along the Grid Connection underground electrical cabling route, cabling will be laid beneath the surface of the cabling track within the Wind Farm Site and along the public road, with no interference of watercourses along the route.

6.3.2.1.1 *Wind Farm Site*

- Where possible all proposed new stream crossings will be bottomless culverts and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no impact on the stream at the proposed crossing location;
- Within the Wind Farm Site where the site underground cabling runs adjacent to a proposed access road or an existing access road proposed for upgrade, the cable will pass over the culvert (where one exists or is proposed) within the access road;
- Within the Wind Farm Site, where a proposed access road crosses an existing field drain, the crossing will include a suitably sized piped at the correct invert level to maintain the existing flow regime and prevent ponding.
- Where a Grid Connection Route cable stream crossing is required, the cable will pass over the watercourse via suspended ducting thereby avoiding any morphological impacts or via directional drilling;
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be incorporated into the design of the proposed crossings. A 10m buffer is applied to main drains to allow for future OPW maintenance;
- Works will be completed in accordance with the requirements of "*Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters";* and,
- 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.

6.3.2.1.2 *Grid Connection*

With respect to the Grid Connection underground electrical cabling route watercourse crossings, 4 construction crossing methods are proposed that will avoid in-stream works and these include:

- **Option A:** Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench. Where no crossing currently exists, the cable will pass over the watercourse in a bottomless box culvert or pre-cast concrete slab in a standard trefoil arrangement. Where required existing culvert crossings will be extended using appropriately sized corripipe.
- **Option B:** Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is not available over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.
- **Option C:** Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete. Where sufficient deck cover is not available to fully accommodate the required ducts, it may be necessary to locally raise the pavement level. Any addition of a new pavement will be tied back into the existing road pavement at grade.

- **Option D:** Directional Drilling (DD) 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 DD method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, for the directional drilling at watercourse/culvert crossings. During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil and thus prevent collapse of the reamed length.

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 include:

- 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; and,
- 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.

6.3.2.1.3 *Construction Methodology*

Additional details on construction methodology are presented below.

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts identified. All relevant bodies i.e. ESB, Westmeath County Council, Offaly County Council etc. will be contacted and all up to date drawings for all existing services sought.
- When the cable is located on public roads, a traffic management plan will be prepared prior to any works commencing. A road opening licence will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1200mm, within which the ducts will be laid.
- The cable ducts will be concrete surrounded where they pass under the public road and under drains or culverts.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the ducts will be shimmed up off of the bed of the trench, to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected. Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.

- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,
- The finished surface is to be reinstated, as per original specification. Off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phase of the Proposed Development.
- Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground power cables.

6.3.3 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 shown in the drainage design drawings included within Appendix 4 to this NIS. 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 Chapter 9 'Water' of the associated EIAR (see Appendix 2) and the CEMP (see Appendix 3).

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 within the CEMP (see Appendix 3) and Sections 9.5.2 – 9.5.3 Chapter 9 of the detailed hydrological assessment (provided here in Appendix 2 of the NIS). The following subsections describe the mitigation measures proposed for the construction phase of the Proposed Development.

6.3.3.1.1 *Underground Cable Watercourse/Culvert Crossings/Service Crossings*

A general description of the various construction methods employed at watercourse/ culvert crossings are described in the following paragraphs below. A list of the stream crossings along the underground electrical cabling route and the proposed crossing method at each location is provided in Section 3.2.6.7.

The stream crossing locations and crossing locations for all culvert crossings are also shown on the underground electrical cable route drawings included within the Grid Connection Infrastructure (Appendix 7 of this NIS).

6.3.3.1.2 *Standard Formation Crossing over Culvert – Option A*

Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench.

Where no crossing currently exists, the cable will pass over the watercourse in a bottomless box culvert or pre-cast concrete slab in a standard trefoil arrangement. Where required existing culvert crossings will be extended using appropriately sized corripipe.

6.3.3.1.3 *Standard Formation Crossing under Culvert – Option B*

Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is not available over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.

6.3.3.1.4 *Shallow Formation Crossing over Culvert – Option C*

Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.

Where sufficient deck cover is not available to fully accommodate the required ducts, it may be necessary to locally raise the footpath level if present, or to locally raise the pavement level. Should the footpath or pavement level be increased, the parapet wall levels will also increase to facilitate the raise in pavement level if required, Any addition of a new pavement will be tied back into the existing road pavement at grade.

6.3.3.1.5 *Directional Drilling – Option D*

In the event that none of the above methods are appropriate, directional drilling (DD) will be utilised.

DD 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 DD method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, for the directional drilling at watercourse/culvert crossings. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the

reception or drilling pits, it will be contained and removed from the Site in the same manner as other subsoil materials associated with the drilling process to a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exits.

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 include:

- 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; and,
- 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.

6.3.3.1.6 *Construction Phase Drainage Management*

Drains will be excavated, and stilling ponds constructed to eliminate any suspended solids within surface water running off the site. The following best practice drainage measures have been incorporated into the Proposed Development for the protection of surface water quality, as described in Section 4.2.4 of the CEMP (included as Appendix 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 where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.
- Collector drains or swales are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Development during the operational phase.
- The velocity of flow in the interceptor drains and collector drains, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the collector drain is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.
- 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..
- Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
- Stilling ponds will be used to attenuate runoff from works areas of the site during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the proposed development during the operational phase.

- 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.
- Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.
- Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where watercourse crossings take place.
- Sediment entrapment mats, consisting of coir or jute matting, will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sediments will be secured to the ground surface using stakes/pegs. The sediment will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.
- All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse.

6.3.3.1.7 *Hydrocarbons and Waste Material*

The use of hydrocarbons during the construction process leads to the potential for pollution to enter the wider environment, including drainage ditches and watercourses. Leaks in poorly maintained plant and machinery could lead to hydrocarbon dispersal over works areas. Leaks in fuel storage tanks and spillages during refuelling operations could lead to larger releases of hydrocarbons into the environment.

The CEMP (see Appendix 3) provides measures to avoid impacts on the wider environment as a result of pollution and are summarised below.

Refuelling, Fuel and Hazardous Materials Storage

The following mitigation measures, as described in the CEMP, (see Appendix 3) are proposed to avoid the potential release of hydrocarbons at the site:

- Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site in bunded areas.
- On-site refuelling of machinery will be carried out at dedicated refuelling locations 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axle custom-built refuelling trailer or similar 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 wind farm. 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 compound when not in use.
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays, spill kits and fuel absorbent mats will be used during all refuelling operations.
- Fuels volumes stored on site should be minimised. Any fuel storage areas 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 shall 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;
- The plant used should be regularly inspected for leaks and fitness for purpose; and,

- An emergency plan for the construction phase to deal with accidental spillages will be contained within Emergency Response Plan (Section 6 of the CEMP). Spill kits will be available to deal with an accidental spillage.

Potential Effects on Local Groundwater Wells

Mitigation measures to protect and ensure the quantity and quality of groundwater during the construction phase of the Proposed Development has been outlined in Sections 9.4.1.4, 9.4.1.5, 9.4.1.6 and 9.4.1.9 of the Hydrological Assessment (see Appendix 2 to this NIS). These broadly include:

Mitigation Measures relating to the use and storage of fuels and chemicals in terms of groundwater protection:

- Onsite re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser, as described in Section 9.4.1.4 of the Hydrological Assessment (Appendix 2). No maintenance of construction vehicles or plant will take place along the temporary junction works areas;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- Spill kits will be available to deal with accidental spillage.

Mitigation measures related to the use and storage of concrete products:

- No batching of wet-cement products will occur on site/along the Grid Connection underground electrical cabling route works. 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; and,
- Where concrete is delivered on-site, only the chute will need to be cleaned, using the smallest volume of water possible. 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 is to be directed into a dedicated concrete wash out pit. Decommissioning of this pit will occur at the end of the construction phase and water and solids will be tanked and removed from the site to a suitable, non-polluting, discharge location.

Mitigation measures related to potential impacts from wastewater disposal:

- The Grid Connection temporary construction compound located within the Wind Farm Site will be used for the construction of the Grid Connection underground electrical cabling route along the northern section of the route (i.e near the Wind Farm Site);
- Welfare cabins and port-a-loos will be used during the construction of the underground electrical cabling connection route, particularly towards the south of the route;
- Port-a-loos with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from Wind Farm Site on completion of the construction works;
- Water supply for the Wind Farm Site office and other sanitation will be brought to Wind Farm Site and removed after use from the Wind Farm Site to be discharged at a suitable off-site treatment location; and,
- No water will be sourced on the Wind Farm Site, or discharged to the Wind Farm Site.

6.3.3.1.8 *Concrete Pouring*

Because of the scale of the main concrete pours that will be required to construct the Proposed Development, the main pours will be planned days or weeks in advance. Special procedures will be

adopted in advance of and during all concrete pours to minimise the risk of pollution. These may include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) or equivalent.
- Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.

6.3.3.2 Field Monitoring

Field chemistry measurements of unstable parameters, (pH, conductivity, temperature) analyses will be carried out by the Environmental Clerk of Works (ECoW) and/or the Project Hydrologist at all surface water monitoring locations. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

6.3.3.3 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely 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 Solid

6.3.4 Operation Phase Mitigation

As detailed in the Hydrological Assessment, included as Appendix 2, the operational phase drainage system will be installed and constructed in conjunction with the road and hardstanding construction work as described below:

- Runoff from individual turbine hardstanding areas will not be discharged into the existing drain network, but discharged locally at each turbine location through settlement ponds and buffered outfalls onto vegetated surfaces;
- Interceptor drains will be installed up-gradient of all 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 be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- On steep sections of access road transverse drains ('grips') will be constructed where appropriate in the surface layer of the road to divert any runoff off the road into swales/road side drains;
- Check dams will be used along sections of access road drains to intercept silts at source.
- Settlement ponds, emplaced downstream of road swale sections and at turbine locations, 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; and,
- Settlement ponds will be designed in consideration of the greenfield runoff rate.

Additionally, the CEMP included as Appendix 3 of this report, outlines a programme of monitoring required for the operational phase of the Proposed Development. The CEMP should be consulted for detailed information on the monitoring requirements during the operational phase, however a brief summary of the key information in relation to screened in European Sites is provided below:

Monthly sampling and laboratory analysis will be undertaken for six months during the operational phase.

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.

Post-construction bird monitoring which includes breeding bird surveys, winter roost surveys and corpse searching on the Site, will be completed in accordance with guidelines issued by the Scottish Natural Heritage (SNH, 2009).

6.3.5 Decommissioning Phase Mitigation

As described in Section 3.2.8 of this NIS, prior to the end of the useful life of the turbines, this equipment may be replaced with a new technology, subject to planning permission being obtained, or the Wind Farm Site may be decommissioned fully. The Grid Connection underground electrical cabling route and onsite substation will remain in place as it will be under the ownership and control of the ESB and Eirgrid.

A Decommissioning Plan has been prepared for the Proposed Development (Appendix 8), the full detail of which will be agreed with the local authority prior to any decommissioning. 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 agreed with the competent authority at that time. As the Decommissioning Plan is a working document the drainage measures are not included in this document. When the final plan is prepared prior to decommissioning and presented as a standalone document, all drainage measures will be included in that document as required. The drainage proposals will be developed further prior to the commencement of decommissioning if deemed necessary. However, it should be noted that by the time decommissioning is undertaken after the planned 30-year lifespan of the Proposed Development, the areas within the

Wind Farm Site will have revegetated resulting in a resumption of the natural drainage management that will have existed prior to any construction. It is not anticipated that the decommissioning phase will interrupt this restored drainage regime in any way with the works proposed. As a minimum measure, areas where freshly placed soil material as part of turbine foundation reinstatement will surrounded by silt fencing if deemed necessary until the area has naturally revegetated.

The potential impacts on water quality associated with the decommissioning phase of the Proposed Development will be similar to those associated with the construction phase. Therefore, all relevant measures described in Section 6.3.3 of this NIS regarding refuelling and fuel and hazardous materials storage (see Section 6.3.3.1.7 of this NIS and Section 3.1.2 of the Decommissioning Plan provided as Appendix 8 to this NIS) will be implemented in full during decommissioning for the protection of water quality and downstream designated sites, and full details will be provided within an updated Decommissioning Plan prior to decommissioning.

7. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

The sections provided below detail the site-specific residual impact assessment in relation to the relevant QIs and SCIs of the EU Sites in light of their site-specific targets and attributes. The assessment takes into consideration the proposed measures to avoid, reduce and block identified pathways for impact.

7.1 Lough Ree SAC

As described in Section 6 of this NIS, the proposed works associated with the construction, operation and decommissioning phases of the Proposed Development have the potential to cause deterioration in surface water quality due to the potential release of pollutants including suspended solids and hydrocarbons, potentially affecting the following groundwater dependant habitats and supporting habitats for aquatic fauna. Potential for direct and indirect disturbance of otter during construction, operation and decommissioning phases was also identified on a precautionary basis relating to this SAC:

- Alkaline fens [7230]
- 3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
- Otter (*Lutra lutra*) [1355]

Mitigation measures have been incorporated into the Proposed Development for the avoidance of impacts in relation to water quality as fully described in Section 6.2.1 and 6.2.2 of this NIS; Section 6.2.4 relates specifically to mitigation in relation to disturbance of otter. The potential for residual adverse impacts on these QI habitats and species, following mitigation, has been assessed in the following subsections.

7.1.1 [1355] Otter (*Lutra lutra*)

The conservation objective for Otter is: '*To maintain the favourable conservation condition of Otter in Lough Ree SAC*'.

The attributes and targets for otter as per the SSCOs for Lough Ree SAC (NPWS Version 1, 2016) and an assessment of the Proposed Development against the attributes and targets for this species is provided below.

Distribution

Otter signs, i.e. otter spraint, was recorded within the Wind Farm Site along the Dungolman River and its tributaries. The location of the otter records within the Wind Farm Site is shown in Figure 4-3. No signs of otter holts were recorded. Although the detailed conservation objectives supporting document (NPWS, 2016) states that 'otters will utilise freshwater habitats from estuary to headwaters' the Proposed Development site is located in excess of ~13km (surface water distance) upstream of the SAC.

The findings suggest that the site of the Proposed Development is not used by a population of otter of greater than local importance.

There is no impact pathway which could lead to a decline in the distribution of this species for which the SAC has been designated associated with the Proposed Development.

Extent of Otter Habitat

There will be no decline in the extent of terrestrial or freshwater habitat associated with the Proposed Development. There will be no instream works. The only identified pathway for effect is via indirect surface water deterioration. This was considered in the design of the Proposed Development and a range of measures (outlined in Sections 3 and 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and Chapter 9 'Water' of the associated EIAR, Appendix 2 of this NIS) are in place to avoid all water pollution during construction, operation and decommissioning.

Holts/ Couching Sites

No couches or holts were identified within the Site, and none were identified in the vicinity of the Proposed Development works. There will be no decline in couching or holt sites associated with the Proposed Development.

As outlined in Section 6.3.1, 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 Development works areas.

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).

Food Availability

There will be no decline in availability of fish biomass associated with the Proposed Development. Pathways that would allow impacts to occur were considered in the design of the Proposed Development and a range of measures, outlined in Section 6.3.2, are in place to avoid all water pollution during construction.

Habitat Fragmentation

The Proposed Development will not result in any barrier to connectivity within or outside the SAC.

7.1.1.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Otter the Lough Ree SAC, in any phase of the Proposed Development.

7.1.2 [3150] Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation

The conservation objective for Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation is:

'To restore the favourable conservation condition of Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation in Lough Ree SAC'

The attributes and targets for this QI as per the SSCOs for Lough Ree SAC (NPWS Version 1, 2016) and an assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 8-2.

Table 7-1 Target and Attribute Table for Natural Eutrophic Lakes

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes	There will be no decline in habitat area or distribution as a result of the proposal. The Proposed Development is located entirely outside of the SAC, and therefore there will be no direct habitat loss. All potential pathways for indirect deterioration in habitat have been blocked. No impacts have been identified in relation to alteration in community, extent, structure or distribution as a result of the Proposed Development and no deterioration in the condition of terrestrial habitat due to the Proposed Development works. The only identified pathway for effect is via indirect water quality deterioration and changes in hydrological regime. This has been considered in the design of the Proposed Development and a range of bespoke mitigation measures (outlined in Section 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and the detailed hydrological assessment, Appendix 2 of this NIS) are in place to avoid all water pollution and changes to surface and groundwater flow during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI Natural Eutrophic Lake habitat of the SAC occurs.
Habitat distribution	No decline, subject to natural processes	
Typical species	Typical species present, in good condition, and demonstrating typical abundances and distribution	
Vegetation composition: characteristic zonation	All characteristic zones should be present, correctly distributed and in good condition	
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	
Lake substratum quality	Maintain appropriate substratum type, extent and chemistry to support the vegetation	
Water quality: transparency	Maintain/restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	
Water quality: nutrients	Maintain the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	
Water quality: phytoplankton biomass	Maintain appropriate water quality to support the habitat, including good chlorophyll a status	
Water quality: phytoplankton composition	Maintain appropriate water quality to support the habitat, including good phytoplankton composition status	
Water quality: attached algal biomass	Maintain trace/absent attached algal biomass (	
Water quality: macrophyte status	Restore good macrophyte status	

Attribute	Target	Assessment
Acidification status	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	
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	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of the lake habitat	

7.1.2.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Natural eutrophic lakes with Magnopotamion or Hydrocharition with the Lough Ree SAC, in any phase of the Proposed Development.

7.1.3 [7230] Alkaline fens

The conservation objective for Alkaline fens is:

'To maintain the favourable conservation condition of Alkaline fens in Lough Ree SAC'.

The attributes and targets for this QI as per the SSCOs for Lough Ree (NPWS Version 1, 2016) and an assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 8-4.

Table 7-2Target and Attribute Table for Alkaline Fens

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes	There will be no decline in habitat area or distribution as a result of the Proposed Development. The Proposed Development is located entirely outside of the SAC, and therefore there will be no direct habitat loss. All potential pathways for indirect deterioration in habitat have been blocked.
Habitat distribution	No decline, subject to natural processes	
Hydrological regime	Appropriate natural hydrological regimes necessary to support the	

Attribute	Target	Assessment
	natural structure and functioning of the habitat	No impacts have been identified in relation to alteration in community, extent, structure or distribution as a result of the Proposed Development and no deterioration in the condition of terrestrial habitat due to the Proposed Development works. The only identified pathway for effect is via indirect water quality deterioration and changes in hydrological regime. This has been considered in the design of the Proposed Development and a range of bespoke mitigation measures (outlined in Section 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and the detailed hydrological assessment, Appendix 2 of this NIS) are in place to avoid all water pollution and changes to surface and groundwater flow during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI Alkaline Fen habitat of the SAC occurs.
Peat formation	Active peat formation, where appropriate	
Water quality: nutrients	Appropriate water quality to support the natural structure and functioning of the habitat	
Vegetation structure: typical species	Maintain vegetation cover of typical species including brown mosses and vascular plants	
Vegetation composition: trees and shrubs	Cover of scattered native trees and shrubs less than 10%	
Physical structure: disturbed bare ground	Cover of disturbed bare ground less than 10%. Where tufa is present, disturbed bare ground less than 1%	
Physical structure: drainage	Areas showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	

7.1.3.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Alkaline Fens still capable of natural regeneration with the Lough Ree SAC, in any phase of the Proposed Development.

7.2 River Shannon Callows SAC

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

7.2.1 [1355] Otter (*Lutra lutra*)

The conservation objective for Otter is:

'To maintain the favourable conservation condition of Otter *(Lutra lutra*) in River Shannon Callows SAC".

The attributes and targets for otter as per the SSCOs for River Shannon Callows SAC (NPWS Version 1, 2022) and an assessment of the Proposed Development against the attributes and targets for this habitat is provided below.

Distribution

Otter signs, i.e. otter spraint, was recorded within the Site along the Dungolman River and its tributaries. The location of the otter records within the study area boundary is shown in Figure 4-3. No signs of otter holts were recorded. Although the detailed conservation objectives supporting document (NPWS, 2022) states that 'otters will utilise freshwater habitats from estuary to headwaters' the Proposed Development site is located in excess of ~13km (surface water distance) upstream of the SAC.

The findings suggest that the site of the Proposed Development is not used by a population of otter of greater than local importance.

There is no impact pathway which could lead to a decline in the distribution of this species for which the SAC has been designated associated with the Proposed Development.

Extent of Otter Habitat

There will be no decline in the extent of terrestrial or freshwater habitat associated with the Proposed Development. There will be no instream works. The only identified pathway for effect is via indirect surface water deterioration. This was considered in the design of the Proposed Development and a range of measures (outlined in Sections 3 and 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and Chapter 9 'Water' of the associated EIAR, Appendix 2 of this NIS) are in place to avoid all water pollution during construction, operation and decommissioning.

Holts/ Couching Sites

No couches or holts were identified within the Site, and none were identified in the vicinity of the Proposed Development works. There will be no decline in couching or holt sites associated with the Proposed Development.

As outlined in Section 6.3.1, 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 Development 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).

Food Availability

There will be no decline in availability of fish biomass associated with the Proposed Development. Pathways that would allow impacts to occur were considered in the design of the Proposed Development and a range of measures, outlined in Section 6.3.2, are in place to avoid all water pollution during construction.

Habitat Fragmentation

The Proposed Development will not result in any barrier to connectivity within or outside the SAC.

7.2.1.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Otter the River Shannon Callows SAC, in any phase of the Proposed Development.

7.2.2 [7230] Alkaline fens

The conservation objective for Alkaline fens is:

'To maintain the favourable conservation condition of Alkaline fens in Lough Ree SAC'.

The attributes and targets for this QI as per the SSCOs for Lough Ree (NPWS Version 1, 2016) and an assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 8-4.

Table 7-3: Target and Attribute Table for Alkaline Fens

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes	There will be no decline in habitat area or distribution as a result of the Proposed Development. The Proposed Development is located entirely outside of the SAC, and therefore there will be no direct habitat loss. All potential pathways for indirect deterioration in habitat have been blocked. No impacts have been identified in relation to alteration in community, extent, structure or distribution as a result of the Proposed Development and no deterioration in the condition of terrestrial habitat due to the Proposed Development works. The only identified pathway for effect is via indirect water quality deterioration and changes in hydrological regime. This has been considered in the design of the Proposed Development and a range of bespoke mitigation measures (outlined in Section 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and the detailed hydrological assessment, Appendix 2 of this NIS) are in place to avoid all water pollution and changes to surface and groundwater flow during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI Alkaline Fen habitat of the SAC occurs.
Habitat distribution	No decline, subject to natural processes	
Ecosystem function: Soil Nutrients	Maintain soil pH and nutrient status within natural ranges	
Ecosystem function: Peat formation	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	

Attribute	Target	Assessment
Vegetation composition: community diversity	Maintain variety of vegetation communities, subject to natural processes	
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	
Vegetation composition: nonnative 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%	
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 of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	

Attribute	Target	Assessment
Transitional areas between fen and adjacent habitats	Maintain adequate transitional areas to support/protect the alkaline fen habitat and the services it provides	

7.2.2.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Alkaline Fens still capable of natural regeneration with the River Shannon Callows SAC, in any phase of the Proposed Development.

7.2.3 [91E0] Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*)

The conservation objective for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* is:

'To maintain the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in River Shannon Callows SAC.'

The attributes and targets for this QI as per the SSCOs for River Shannon Callows SAC (NPWS Version 1, 2016) and an assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 7-3.

Table 7-4Target and Attribute Table for Alluvial forests with Alnus glutinosa and Fraxinus excelsior:

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes	There will be no decline in habitat area or distribution as a result of the Proposed Development. The Proposed Development is located entirely outside of the SAC, and therefore there will be no direct habitat loss. All potential pathways for indirect deterioration in habitat have been blocked. No impacts have been identified in relation to alteration in community, extent, structure or distribution as a result of the Proposed Development and no deterioration in the condition of terrestrial habitat due to the Proposed Development works. The only identified pathway for effect is via indirect water quality deterioration and changes in hydrological regime. This has been considered in the design of the Proposed Development and a range of bespoke mitigation
Habitat distribution	No decline, subject to natural processes. The surveyed woodland area is shown on map 6 of the Conservation Objectives document.	
Woodland size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	
Woodland structure: cover and height	Total canopy cover at least 30%; median canopy height at least 7m; native shrub layer cover 10-75%; native	

Attribute	Target	Assessment
	herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	measures (outlined in Section 6.2 of this NIS, the CEMP (Appendix 3 of this NIS) and the detailed hydrological assessment, Appendix 2 of this NIS) are in place to avoid all water pollution and changes to surface and groundwater flow during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)habitat of the SAC occurs.
Woodland structure: community diversity and extent	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedlings, saplings, and pole age-classes of target species for 91E0* woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	
Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	

7.3 Lough Ree SPA

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 First Order Site-Specific Conservation Objectives of those habitats and species.

7.3.1 Wetland and Waterbirds

First Order Site-Specific Conservation Objectives are listed for Lough Ree SPA, however for the purpose of the SCI Wetland and waterbirds attributes and targets were taken from a nearby site of Inner Galway Bay SPA. The attributes and targets for Wetland and Waterbirds as per the Site-Specific Conservation Objectives (SSCOs) for Inner Galway Bay SPA (NPWS, 2013[9]) and an assessment of the Proposed Development against the nominated attributes and targets for the SCI is provided in Table 7-7 below.

Table 7-5 Target and Attribute Table for Wetlands and waterbirds

Attribute	Target	Assessment
Habitat area	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 13,267ha, other	The site does not support significant suitable wetland habitat for SCI bird species. There will be no reduction in the area occupied by wetland habitat as a result of the development. A suite of best practice measures has been incorporated into the design to

[9] *NPWS (2013) Conservation Objectives: Inner Galway Bay SPA 004031. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.*

	than that occurring from natural patterns of variation	avoid and minimise potential impacts caused by degradation in water quality, as outlined in Section 6.

7.3.1.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Wetland and Waterbirds associated with the Lough Ree SPA in any phase of development.

7.4 Conclusion of Residual Impact Assessment

Based on the above, in view of best scientific knowledge, on the basis of objective information, the Proposed Development will not adversely affect surface or ground water in the area during either construction or operation of the Proposed Development. There is no potential for adverse impacts on the identified QIs/SCIs and their associated targets and attributes, or on any European Site via these identified pathways, which have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the Proposed Development design.

Taking cognisance of measures to avoid impacts and best practice/mitigation measures incorporated into the project design which are considered in the preceding section, the Proposed Development will not have an adverse effect on the integrity of any European site.

The Proposed Development will not prevent the QIs/SCIs of European Sites from achieving/maintaining 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 the Lough Ree SAC and Lough Ree SPA.

7.5 Middle Shannon Callows SPA

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.

7.5.1 Wetland and Waterbirds

For the purpose of the SCI Wetland and waterbirds the site-specific objectives were taken from the Conservation Objectives listed for this site. The attributes and targets for Wetland and Waterbirds as per the Site-Specific Conservation Objectives (SSCOs) for Middle Shannon Callows SPA (NPWS, 2022) and an assessment of the Proposed Development against the nominated attributes and targets for the SCI is provided in Table 7-8 below.

Table 7-6 Target and Attribute Table for Wetlands and waterbirds

Attribute	Target	Assessment
Wetland habitat area	No significant loss to wetland habitat within the SPA, other than that occurring from natural patterns of variation	The site does not support significant suitable wetland habitat for SCI bird species. There will be no reduction in the area occupied by wetland habitat as a result of the Proposed Development. To ensure no significant impact will occur on the quality or functioning of the wetland habitat, a suite of best practice measures has been incorporated into the Proposed Development design to avoid and minimise potential impacts caused by degradation in water quality, As outlined in Section 6.
Wetland habitat quality and functioning	No significant impact on the quality or functioning of the wetland habitat within the SPA, other than that occurring from natural patterns of variation	

7.5.1.1 Determination on potential for adverse effects

Based on the above, it can be concluded, in view of best scientific knowledge and based on objective information and the conservation objectives of the site, that the Proposed Development will not adversely affect the QI Wetland and Waterbirds associated with the Middle Shannon Callows SPA in any phase of the Proposed Development.

7.6 Conclusion of Residual Impact Assessment

Based on the above, in view of best scientific knowledge, on the basis of objective information, the Proposed Development will not adversely affect surface or ground water in the area during either construction or operation of the Proposed Development. There is no potential for adverse impacts on the identified QIs/SCIs and their associated targets and attributes, or on any European Site via these identified pathways, which have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the Proposed Development design.

Taking cognisance of measures to avoid impacts and best practice/mitigation measures incorporated into the Proposed Development design which are considered in the preceding section, the Proposed Development will not have an adverse effect on the integrity of any European site.

The Proposed Development will not prevent the QIs/SCIs of European Sites from achieving/maintaining 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 the screened in European Sites as follows:

- Lough Ree SAC
- River Shannon Callows SAC
- Lough Ree SPA
- Middle Shannon Callows SPA

8. CUMULATIVE 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. This assessment focuses on the potential for cumulative in-combination effects on the European Sites where potential for adverse effects was identified at the Screening Stage, see Section 3 of this report. 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.

Where potential pathways for effect have been identified in the Screening Assessment (see Table 3-1 of accompanying Screening Assessment), the potential for cumulative effects resulting from the Proposed Development when considered in combination with other plans and projects, cannot be discounted at this stage and further assessment is required. Further assessment is required in relation to the following sites:

- Lough Ree SAC [000440]
- River Shannon Callows SAC [000216]
- Lough Ree SPA [004064]
- Middle Shannon Callows SPA [0004096]

8.1 Assessment of Plans

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

- Westmeath County Development Plan 2021-2027
- Offaly County Development Plan 2021 - 2027
- National Biodiversity Action Plan 2017-2021
- Draft 4th National Biodiversity Action Plan 2023-2027
- Eastern and Midland Regional assembly: Regional Spatial and Economic Strategy 2019–2031

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.

Table 8-1 Review 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
Westmeath County Development Plan 2021-2027	The overall objective of the Development Plan has been identified: *Continue to protect and enhance the County's natural heritage and biodiversity and ensure that networks of green infrastructure are identified, created, protected and enhanced to provide a wide range of environmental, social and economic benefits to communities.* **Policies: Natural Heritage** It is the policy of the Council to: **CPO 12.1** › Contribute as appropriate towards the protection of designated sites in compliance with relevant EU Directives and applicable national legislation **CPO 12.2** › Support the implementation of any relevant recommendations contained in the National Biodiversity Plan, the All-Ireland Pollinator Plan and the National Peatlands Strategy. **Policies: Natura 2000** It is a policy of the Council to: **CPO 12.4** › Protect and conserve Special Areas of Conservation, candidate Special Areas of Conservation, Special Protection	The Development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites. No potential for negative cumulative impacts when considered in combination with the Proposed Development were identified.

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
	Areas and candidate Special Protection Areas, designated under the EU Birds and Habitats Directives respectively. **CPO 12.5** › Ensure that no plans, programmes, etc. or projects giving rise to significant cumulative, direct, indirect or secondary impacts on European Sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan (either individually or in combination with other plans, programmes, etc. or projects).* **CPO 12.6** › Ensure that any plan or project that could have a significant adverse impact (either by themselves or in combination with other plans and projects) upon the conservation objectives of any Natura 2000 Site or would result in the deterioration of any habitat or any species reliant on that habitat will not be permitted.* ** Except as provided for in Article 6(4) of the Habitats Directive, viz. There must be a) no alternative solution available, b) imperative reasons of overriding public interest for the project to proceed; and c) Adequate compensatory measures in place.* **Policies: Rare and Protected Sites** It is a policy of the Council to:	

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
	CPO 12.13 › Protect, manage, and enhance the natural heritage, biodiversity, landscape and environment of County Westmeath, in recognition of its importance as both a non-renewable resource and a natural asset. **CPO 12.18** › Consult with the National Parks and Wildlife Service (NPWS) in regard to any developments (those requiring permission and those not requiring planning permission) which the Council proposes to carry out within pNHAs, NHAs, SACs, SPAs, and other important ecological sites. **Policies: Invasive species** It is a policy of the Council to: **CPO 12.27** › Prevent the spread of invasive species within the plan area, including requiring landowners and developers to adhere to best practice guidance in relation to the control of invasive species **CPO 12.29** Support, as appropriate, the National Parks and Wildlife Service's efforts to seek to control and manage the spread of non-native invasive species on land and water. Where the presence of non-native invasive species is identified at the site of any proposed development or where the proposed activity has an elevated risk of resulting in the presence of these 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
	details of how these species will be managed and controlled will be required.	
Offaly County Development Plan 2021 - 2027	**Designated and Non-designated Sites** **BLP-01:** It is Council policy to protect, conserve, and seek to enhance the county's biodiversity and ecological connectivity. **BLP-02:** It is Council policy to conserve and protect habitats and species listed in the Annexes of the EU Habitats Directive (92/43/EEC) (as amended) and the Birds Directive (2009/147/EC), the Wildlife Acts 1976 (as amended) and the Flora Protection Orders. **BLP-03:** It is Council policy to support and co-operate with statutory authorities and others in support of measures taken to manage proposed or designated sites in order to achieve their conservation objectives. **BLP-05:** It is Council policy to ensure that development does not have a significant adverse impact, incapable of satisfactory avoidance or mitigation, on plant, animal or bird species protected by law. **BLP-06:** It is Council policy to consult with the National Parks and Wildlife Service, and take account of any licensing requirements, when undertaking, approving or authorising development which is likely to affect plant, animal or bird species protected by law. **BLP-07:** It is Council policy to support the implementation of the National Biodiversity Action Plan 2017- 2021 and the Offaly Heritage Plan Key Actions 2017-2021 and future editions in partnership with relevant stakeholders subject to available resources.	The Development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites. No potential for negative cumulative impacts when considered in combination with the Proposed Development were identified.

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
	BLP-08: It is Council policy to work with all state agencies to promote the development of all aspects of park management in the Slieve Bloom Mountains.	
Eastern and Midland Regional assembly: Regional Spatial and Economic Strategy 2019 – 2031	**11. Biodiversity and Natural Heritage** Promote co-ordinated spatial planning to conserve and enhance the biodiversity of our protected habitats and species including landscape and heritage protection. (NSO 7, 8) **Guiding Principles:** **Integration of Land Use and Transport** Ensure the protection of Natura 2000 networks and associated ecological linkages. Plans and projects that have the potential to negatively impact on Natura 2000 sites should be subject to the requirements of the Habitats Directive. **Surface Water** Take opportunities to enhance biodiversity and amenity and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned. Plans and projects that have the potential to negatively impact on Natura 2000 sites should be subject to the requirements of the Habitats Directive. **Regional policy objectives:** **Water Supply** **RPO 10.6:** Delivery and phasing of services shall be subject to the required appraisal, planning and environmental assessment processes and shall avoid adverse impacts on the integrity of the Natura 2000 network.	There will be no adverse effects on QI's/SCI's/SSCO's as a result of deterioration in water quality or disturbance. The Proposed Development has been designed to avoid any effects on water quality and/or designated natura sites outside the site as set out in section 6 of this NIS.

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
	RPO 10.7: Local authority core strategies shall demonstrate compliance with DHPLG Water Services Guidelines for local authorities and demonstrate phased infrastructure – led growth that is commensurate with the carrying capacity of water services and prevent adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network. **Green Infrastructure** **RPO 7.22**: Local authority development plan and local area plans, shall identify, protect, enhance, provide and manage Green Infrastructure in an integrated and coherent manner and should also have regard to the required targets in relation to the conservation of European sites, other nature conservation sites, ecological networks, and protected species. **Ports** **RPO 8.24:** The EMRA supports the undertaking of feasibility studies to determine the carrying capacity of ports in relation to potential for likely significant effects on associated European sites including SPAs and SACs. **Environmental Assessment and Assessment of Greenhouse Gas (GHG) Emissions** **RPO 3.4:** Ensure that all plans, projects and activities requiring consent arising from the Regional Spatial and Economic Strategy are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate. In addition the future strategic development of settlements throughout the Region will have full cognisance of the legal	

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
	requirements pertaining to sites of International Nature Conservation Interest. **Biodiversity and Natural Heritage** **RPO 7.16:** Support the implementation of the Habitats Directives in achieving an improvement in the conservation status of protected species and habitats in the Region and to ensure alignment between the core objectives of the EU Birds and Habitats Directives and local authority development plans.	
Draft 4th National Biodiversity Action Plan 2023-2027	**Objective 2 - Meet Urgent Conservation and Restoration Needs** **Outcome 2A:** The protection of existing designated areas and species is strengthened and conservation and restoration within the existing protected are network are enhanced 29 **Outcome 2B:** Biodiversity and ecosystem services in the wider countryside are conserved 32 18 27 Navigation **Outcome 2C:** All freshwater bodies are of at least 'Good Ecological Status' as defined under the EU Water Framework Directive 36 **Outcome 2D:** Genetic diversity of wild and domesticated species is safeguarded 39 **Outcome 2E:** A National Restoration Plan is in place to meet EU Biodiversity Strategy 2030 nature restoration targets 41 **Outcome 2F:** Biodiversity and ecosystem services in the marine environment are conserved and restored 42 **Outcome 2G:** Invasive alien species (IAS) are controlled and managed on an all-island basis to reduce the harmful impact they have on biodiversity and measures are undertaken to tackle the introduction and spread of new IAS to the environment	There will be no adverse effects on designated sites or biodiversity as a result of the Proposed Development. The Proposed Development will not impact on connectivity within the wider area and will maintain watercourses within and adjacent to the development site in good condition. No Invasive species were present within the T2 site, and the Proposed Development will not contribute to the spread of invasive 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
National Biodiversity Action Plan 2017-2021	**Target 4.2**: Principal pollutant pressures on terrestrial and freshwater biodiversity substantially reduced by 2020. **Target 6.2:** Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020	Having reviewed the conservation objectives and supporting documents for Lough Ree SAC, Charleville Wood SAC, Clara Bog SAC and Lough Ree SPA, there will be no barrier to achievement of this target as a result of the Proposed Development. There will be no adverse effects on designated sites or biodiversity as a result of the Proposed Dvelopment works. There will be no impact on designated sites or other natural heritage interests as a result of deterioration of water quality. There will be no adverse residual effects on sensitive aquatic receptors listed as QIs/SCIs of European Sites as a result of deterioration in water quality.

8.2 Other Projects

The potential cumulative impact of the Proposed Development and combined with the potential impact of other projects or plans has been carried out with the purpose of identifying what influence the Proposed Development will have on the surrounding environment when considered collectively with approved and existing projects, projects pending a decision from the planning authority, projects in the public domain such as those Strategic Infrastructure Development (SID) at pre-consultation with An Bord Pleanála, and land-uses in the vicinity of the Proposed Development site location.
The cumulative impact assessment of projects has three principle aims:

- To establish the range and nature of existing and approved projects within the cumulative impact study area of the Proposed Development.
- To summarise the relevant projects which have a potential to create cumulative impacts.
- To identify the projects that hold the potential for cumulative interaction within the context of the Proposed Development and discard projects that will neither directly or indirectly contribute to cumulative impacts.

Assessment material for this cumulative impact assessment was compiled on the relevant developments within the vicinity of the Proposed Development. The material was gathered through a search of relevant online Planning Registers, reviews of relevant Appropriate Assessment, EIAR (or historical EIS) documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts.

8.2.1 Cumulative Study Areas

The geographical boundaries of the various zones of sensitivity of and to the Proposed Development from which there may be potential for cumulative impacts to arise relative to screened-in European Sites is presented below in Table 8-2. The maximum geographical extent and justification for this extent was established and is presented below.

Table 8-2: Cumulative Study Areas

Individual Topic	Maximum Extent	Justification
Biodiversity	1km from Wind Farm Site Boundary. 200m from Grid Connection underground electrical cabling route. Consideration for the Biodiversity cumulative extent is also given to the Birds and Water cumulative geographical boundaries (see below).	Using the precautionary approach and given the nature and scale of the Proposed Development, the geographical boundary for terrestrial ecological aspects, i.e. habitats, is 1km for cumulative assessment for the Wind Farm Site and 200m from Grid Connection underground electrical cabling route.
Birds	25km buffer from proposed turbines	NatureScot guidance '*Assessing the Cumulative Impacts of onshore Wind Energy Developments*' (SNH, 2012; 2018) was consulted while undertaking the cumulative assessment. SNH (2012; 2018)

		emphasises that its priority is to '*maintain the conservation status of the species population at the national level.*' However, it is acknowledged that consideration should also be allowed for impacts at the regional level '*where regional impacts have national implications (for example where a specific region holds the majority of the national population)*'. Following the guidance of SNH (2012), the cumulative impact assessment has been carried out at the scale of the importance rating of the receptor. A 25km radius of the Proposed Development turbines was considered a reasonable approximation of the size of a county and a 5km radius of the Proposed Development turbines was considered a reasonable approximation for the local level.
Water	**Wind Farm Site:** Upper and Lower Shannon Catchment for proposed, permitted or existing wind-farm developments River Sub Basins for all smaller proposed, permitted or existing plans or projects (i.e. private and commercial type developments). **Grid Connection:** Within a 200m buffer zone of the Grid Connection underground electrical cabling connection route.	Regional surface water catchments are used for cumulative impact assessment with regard large infrastructural developments such as wind farms, energy and public transport developments. The potential for cumulative effects for these developments likely exists on a regional catchment scale (i.e. significant works likely existing in several sub-basins). Therefore, other wind-farm developments are considered within the Shannon Catchment for cumulative effects. River Sub Basins are used for smaller developments (i.e. private & commercial type developments). These developments are not likely to present a significant cumulative impact risk on a regional catchment scale as any effects would likely be imperceptible as a result of the setback distances and localised nature of the associated works. Given the nature and scale of the proposed works and the lack of hydrological cumulative impact potential beyond the river sub basin scale, the Water cumulative study area is defined by river sub basins in which the Proposed Development is located. Due to the narrow nature of the underground electrical cabling route trench (~0.6m wide), a 200m buffer zone is an appropriate scale when considering

		potential cumulative effects on the water environment.

8.2.2 Other Wind Farm Sites

There are 9 no. wind farm developments operational, consented or proposed, that have been identified due to either an application, a request for pre-application consultation having been lodged or permitted, or proposed wind farm projects identified in the Public Domain within the cumulative study area.

- Lemanaghan (Pre-Application Phase – ABP 310844) – 13-17 turbines
- Leabeg Wind Farm (Existing) – 2 turbines
- Coole Wind Farm (Significant FI requested) - 15 turbines / (Granted 27/03/2019 (subject to Judicial Review)) – 13 turbines

- Derrinlough (Granted) – 21 turbines
- Cloghan (Granted) – 9 turbines
- Kepak (Kilbeggan) (FI requested) – 1 turbine
- Lissanore (FI received) – 1 turbine
- Derryadd (Pre-Application Phase – ABP 314965) – 25 turbines

Further details of these projects are provided within Sections 1.5 and 1.6 of Appendix 8.

8.2.2.1 Lemanaghan Wind Farm

The site proposed for Lemanaghan Wind Farm is c. 18.2km south of the proposed turbines within the Wind Farm Site.

The Lemanaghan project is at the pre-application stage, and no specific information regarding potential residual effects on ecological receptors was available. However, the following factors limit the potential for significant cumulative effects to result: the nature of the habitats on that site (as reviewed on publicly available aerial photography) and the lack of significant residual impacts on biodiversity associated with the Proposed Development when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.2 Leabeg Wind Farm

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Leabeg Wind Farm project which is located c. 25km south of the proposed turbines within the Wind Farm Site was considered. No specific information regarding potential residual effects on ecological receptors was available for this wind farm. However, the following factors limit the potential for significant cumulative effects to result: the nature of the habitats on that site (as reviewed on publicly available aerial photography) and the lack of significant residual impacts on biodiversity associated with the Proposed Development when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.3 Coole Wind Farm

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Coole Wind Farm project, which is located 34km northeast of the proposed turbines within the Wind Farm Site was considered. The planning file was reviewed on the ABP case viewer and the NIS[10] for the project consulted. The NIS concluded that '*Following an examination, evaluation and analysis, in light of best scientific knowledge and the conservation objectives of the site, and, on the basis of objective information, having taken into account the relevant mitigation measures, it can be concluded that the Proposed Development will not have an adverse impact on any European Sites, either alone or in combination with other plans or projects*'. Based on the information available in the Coole Wind Farm NIS, significant cumulative impacts in combination with the proposed development are not anticipated.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.4 Derrinlough Wind Farm

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Derrinlough Wind Farm project, which is located 32km northeast of the proposed turbines within the Wind Farm Site was considered. The planning file was reviewed on the ABP case viewer and the NIS[11] for the project consulted. The NIS concluded that '*Following an examination, evaluation and analysis, in light of best scientific knowledge and the conservation objectives of the site, and, on the basis of objective information, having taken into account the relevant mitigation measures, it can be concluded that the proposed development will not have an adverse impact on any European Sites, either alone or in combination with other plans or projects.*' Based on the information available in the Derrinlough Wind Farm NIS, significant cumulative impacts in combination with the Proposed Development are not anticipated.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.5 Cloghan Wind Farm

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Cloghan Wind Farm project, which is located 33km to the south of the proposed turbines within the Wind Farm Site, was considered. The planning file was reviewed on the Offaly County Council planning viewer and the NIS[12] for the project consulted. The NIS concluded that '*Taking into account of the mitigation measures proposed for the avoidance and reduction adverse effectson the qualifying interests and conservation objectives of the designated Natura 2000 sites within the study area it is concluded that the proposed Cloghan Wind Farm development will not result in direct, indirect or cumulative impacts which would have the potential to adversely affect the qualifying interests/ special conservation interests of the Middle Shannon Callows SPA, All Saints Bog SPA, Dovegrove Callows SPA, Little Brosna Callows SPA, River Suck Callows SPA and Mongan Bog SPA with regard to the range population densities or conservation status of the habitats and species for which these sites are*

[10] *MKO (2021), Natura Impact Statement, Coole Wind Farm, County Westmeath.*
[11] *MKO (2020), Natura Impact Statement, Derrinlough Wind Farm, County Westmeath.*
[12] *Ecofact Environmental Consultants (2014), Natura Impact Statement, Cloghan Wind Farm.*

designated... It is considered that the proposed wind farm development, in addition to the implementation of the prescribed mitigation measures, would not give rise to significant impacts affecting the integrity of any designated site within the Natura 2000 network'. Based on the information available in the Cloghan Wind Farm NIS, significant cumulative impacts in combination with the Proposed Development are not anticipated.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.6 Kepak Wind Farm

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Kepack Wind Farm project, which is located 18km to the southeast of the proposed turbines within the Wind Farm Site, was considered. The planning file was reviewed on the Westmeath County Council planning viewer and the AASR[13] for the project consulted. The AASR concluded that '*As the effects that could arise from the Plan have been examined in the context of several factors that could potentially affect the integrity of any European Site(s). On the basis of the findings of this Screening for AA, it is concluded that the proposed development:*

- *Is not directly connected with or necessary to the management of any European Site*
- *And will not have adverse effects on the integrity of the Split Hills and Long Esker SAC*

Therefore, in conclusion a Stage 2 AA is not required for the proposed development. On the basis of this screening assessment which determined that, in view of the best scientific knowledge potential likely significant effects from the Proposed Development can be ruled out for the Split Hills and Long Esker SAC, in view of the conservation objectives of this European Site. A stage 2 (Appropriate Assessment) is therefore not required to assist the competent authority (Westmeath County Council) in undertaking an Appropriate Assessment of the potential for adverse effects from the Proposed Development, alone or in combination with other plans and projects, on the integrity of this European Site.'

Based on the information available in the Kepack Wind Farm AASR, significant cumulative impacts in combination with the Proposed Development are not anticipated.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.7 Lissanore Wind Turbine

The potential for the Proposed Development to result in significant cumulative effects when assessed alongside the Lissanore Wind Farm project, which is located 18km to the southeast of the proposed turbines within the Wind Farm Site, was considered. The planning file was reviewed on the Westmeath County Council planning viewer and the AASR[14] for the project consulted. The AASR concluded that '*The first stage of the Appropriate Assessment process, screening, has been completed in compliance with the relevant European Comission and national guidelines... The Screening Assessment undertaken for the proposed 4.2MW wind turbine at Lissanore, Co. Longford in Section 4.3 above has determined*

[13] *VEON (2022), Article 6(3) Appropriate Assessment Screening Report, Wind Turbine Installation, Kepack, Kilbeggan, Co. Westmeath.*
[14] *EirEco (2022), Appropriate Assessment Screening Report for Single Wind Turbine at Lissanore, Co. Longford.*

that the proposed development presents no risk of giving rise to any significant or other impacts within any European Designated Conservation Areas'.

Based on the information available in the Lissanore Wind Farm AASR, significant cumulative impacts in combination with the Proposed Development are not anticipated.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.2.8 Derryadd Wind Farm

The site proposed for the Derryadd Wind Farm project is c. 18.2km south of the proposed turbines within the Wind Farm Site.

The Derryadd project is at the pre-application stage, and no specific information regarding potential residual effects on ecological receptors was available. However, the following factors limit the potential for significant cumulative effects to result: the nature of the habitats on that site (as reviewed on publicly available aerial photography) and the lack of significant residual impacts on biodiversity associated with the Proposed Development when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative effects with the Proposed Development. Taking into consideration also the fact that no significant residual effects on European Sites have been identified for the Proposed Development (post mitigation) significant cumulative effects on key ecological receptors are not anticipated.

8.2.3 Non-Renewable Energy Developments

Section 1.3 And Section 1.4 of Appendix 8 of this NIS provides a list of all non-wind farm development existing and approved projects as well as planning applications pending a decision within a 2km of the proposed turbine infrastructure within the Wind Farm Site and within 200m of the underground electrical cabling route. The material was gathered through a search of relevant online Planning Registers, reviews of relevant Appropriate Assessment, EIAR (or historical EIS) documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts. Here a 2km distance from proposed turbines within the Wind Farm Site, and review of all projects (existing and permitted) within 200m of the underground electrical cabling route has been considered for operational and construction purposes as an appropriate buffer to identify potential sensitive receptors and cumulative projects in the non-renewable energy category that should be considered in the context of the Proposed Development. This distance was also considered to be proportional to the likely zone of influence of the developments listed, which are relatively small-scale. Many of the noted applications relate to agricultural developments and/or single residential developments.

8.2.4 Conclusion of Cumulative Assessment

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on any of the European Sites, their integrity or their conservation objectives when considered on its own. There is therefore no potential for the Proposed Development to contribute to any cumulative adverse effects on any European Site when considered in-combination with other plans and projects.

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

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified with regard to any European Site.

9. CONCLUDING STATEMENT

This NIS has provided an assessment of all potential direct or indirect adverse effects on European Sites whether considered individually or in combination with other plans and projects.

Where the potential for any adverse effect on any European Site has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report and its appendices. The measures ensure that the construction and operation of the Proposed Development does not adversely affect the integrity of European sites.

Therefore, it can be objectively concluded that the Proposed Development, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site

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APPENDIX 1

APPROPRIATE ASSESSMENT SCREENING REPORT

APPENDIX 2

HYDROLOGICAL ASSESSMENT (CH 9 WATER)

APPENDIX 3

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

APPENDIX 4

DETAILED DRAINAGE DESIGN / DRAINAGE DRAWINGS

APPENDIX 5

ORNITHOLOGY FIGURES AND DETAILED RESULTS

APPENDIX 6

DETAILED DESIGN DRAWINGS

APPENDIX 7

GRID CONNECTION INFRASTRUTURE DESIGN DRAWINGS

APPENDIX 8

DECOMMISSIONING PLAN

APPENDIX 9

LIST OF PROJECTS FOR CUMULATIVE ASSESSMENT