Planning and Environmental Consultants

Natura Impact Statement

Proposed Seven Hills Wind Farm, Co Roscommon

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Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

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1. INTRODUCTION

1.1 Background

MKO and SLR Consulting have been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment of a proposed twenty-turbine wind energy development and all associated infrastructure and Grid Connection route at Cuilleenoolagh and adjacent townlands in Co. Roscommon.

MKO have provided the assessment of Special Areas of Conservation (SAC) and supporting wetland habitat for Special Conservation Interest species associated with Special Protection Areas (SPA). SLR consulting have provided the assessment with respect to avian receptors associated with Special Protection Areas.

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 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 [Chapter 6/7] 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.

1.2 Statement of Authority

The baseline ecological surveys at the site were undertaken by David McNicholas (B.Sc., M.Sc., MCIEEM), Patrick Ellison (BSc., MSc., ACIEEM), Katie Pender (BSc.), Cathal Bergin (BSc.) and Rudraksh Gupta (BSc., MSc.). All surveyors have relevant academic qualifications and experience in undertaking habitat and ecological assessments.

Dedicated bird surveys of the site were undertaken during the period October 2018 to September 2021, and an ornithological assessment has been carried out, by Mike Austin MCIEEM and Dr Jonathon Dunn MICEEM and reviewed by Duncan Watson CEnv MCIEEM, all of SLR Consulting. Mike is a Senior Ornithologist with over 30 years' professional experience who has undertaken ornithological assessments for over 15 wind farms across the UK and Ireland. Jonathon is a Senior Ornithologist with over 6 years' professional experience who has worked on multiple wind farm projects in Ireland. Duncan is a Technical Director with over 23 years' professional experience and has worked on over 80 proposed, consented and operational wind farm developments throughout the UK and Ireland.

MKO have provided the assessment of Special Areas of Conservation and supporting wetland habitat for Special Conservation Interest species associated with Special Protection Areas. This input has been prepared by Patrick Ellison. Patrick is an experienced ecologist with over 5 years' professional experience. MKO's input 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

SLR Consulting have provided the assessment with respect to avian receptors associated with Special Protection Areas. This input has been prepared by Jonathon Dunn and reviewed by Duncan Watson.

1.1 Structure and Format of this NIS

This Natura Impact Statement (NIS) firstly provides a summary of the findings of the 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. This sets out the scope of the NIS. Following this, all elements of the Proposed Development are fully described in Section 3, as is the baseline environment in Section 4 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 and prescribes mitigation to eliminate any identified pathways for impact. Section 6 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 was considered. A concluding statement is provided in Section 9.

2. SUMMARY CONCLUSIONS OF APPROPRIATE ASSESSMENT SCREENING REPORT

The Article 6(3) Appropriate Assessment Screening Report, that is provided as Appendix 1 to this NIS, identified the potential for the Proposed Development to result in likely significant effects on the following European Sites:

- Ballynamona Bog And Corkip Lough SAC
- Killeglan Grassland SAC
- Four Roads Turlough SAC
- River Shannon Callows SAC
- Lough Croan Turlough SPA
- River Suck Callows SPA
- Four Roads Turlough SPA
- Lough Ree SPA
- Middle Shannon Callows SPA

Each of these sites is discussed individually below in terms of the Qualifying Interests (QI)/Special Conservation Interests (SCI) 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 a radius of 15 km surrounding the Proposed Development site, as well as considering European Sites beyond this distance as required. The Likely Zone of Influence for the purposes of the screening exercise was taken as being 15km given the nature of pathways for effect identified and that no hydrological connectivity or any other potential pathways for effect were identified to European Sites over 15km from the site of the Proposed Development. The location of European Sites within 15km of the Proposed Development is provided as Figure 2-1.

This distance was considered to be appropriate given that no hydrological connectivity was identified from the Proposed Development to any European sites further than this distance. In the absence of any potential hydrological connectivity, no other potential impacts of the Proposed Development (see Section 3 of the AA Screening Report) were identified that could result in any significant effects on QI habitats or species occurring over 15km away.

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 Proposed Development sites 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 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.

As a precaution, in addition to considering European sites within 15 km, the potential for ecological connectivity with European Sites at distances of greater than 15 km from the Proposed Development was also considered. No potential pathways for effect on SPAs at distances over 15km were identified (see above). Mongan Bog SPA (Site Code: 004017) is located 17 km from the Proposed Development site and is designated only for Greenland white-fronted goose. As the core foraging range for this species is 5-8 km (SNH, 2016), this SPA is not ecologically connected to the Proposed Development site, as it is located well beyond the likely regular dispersal or foraging distance for this species. The next closest SPA to the Proposed Development is River Little Brosna Callows (Site Code: 004086), which is located c. 30 km from the Proposed Development site. This is well beyond the likely regular dispersal or foraging distance for any SCI species (as stated above, the largest core foraging range for any terrestrial bird species is 15-20 km). As such the five SPAs listed above are the only SPAs for which further consideration is required within this NIS.

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.

Lisnageeragh Bog and Ballinastack Turlough SAC
Lough Lurgeen Bog/Glenamaddy Turlough SAC
Camderry Bog SAC
Aughrim (Aghrane) Bog SAC
Ballygar (Aghrane) Bog SAC
Curraghlehanagh Bog SAC
Shankill West Bog SAC
Carrownagappul Bog SAC
Ballinturly Turlough SAC
Lisduff Turlough SAC
Four Roads Turlough SAC
River Suck Callows SPA
Lough Croan Turlough SAC
Killeglan Grassland SAC
River Suck Callows SPA
Glenloughaun Esker SAC
Fortwilliam Turlough SAC
Lough Ree SAC
Lough Ree SPA
Lough Ree SAC
Lough Ree SPA
Lough Funshinagh SAC
Lough Ree SAC
Ballynamona Bog And Corkip Lough SAC
Castlesampson Esker SAC
Grosswood
Middle Shannon Callows SPA
River Shannon Callows SAC
Middle Shannon Callows SPA
River Shannon Callows SAC
Pilgrim's Road Esker SAC
Mongan Bog SAC
Mongan Bog SPA
River Shannon Callows SAC
Fin Lough (Offaly) SAC

Map Legend

- EIAR Boundary
- Grid Connection Route
- ZoI from Wind Farm Site
- River Waterbodies (WFD)
- Hydrological Subcatchments (WFD)

EU Designated Sites

- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

Drawing Title: European Sites within the Zone of Influence

Project Title: Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
PE	JH
Project No.	Figure No.
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MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Site Location

The Proposed Development site (EIAR Site Boundary) is located northeast and southeast of the village of Dysart, approximately 1.5 kilometres away at its closest point and approximately 11 kilometres northwest/west of the town of Athlone, Co. Roscommon.

The approximate location for the centre of the site is E587977, N745843. The proposed site covers an area of approximately 588 hectares, in total, and it is divided into two Clusters Southern Clusters and Northern Cluster). The site location is shown on Figure 3-1. For the purposes of this report the 'Proposed Development site' or the 'site' hereafter refers to the lands within the boundaries shown in Figure 3-1.

The land uses and types within the Proposed Development site are almost entirely agricultural grasslands which are used for grazing and pasture farming in its current land use, with some small areas of scrub. Other land types within the surrounding area consist of small areas of non-commercial forestry, scrub, peat-cutting and low-density residential areas in nearby villages. There are a number of small lakes, turloughs and seasonal lakes are located within proximity of the site, which drain into the river suck, a tributary of the River Shannon, approximately 3km west of the Proposed Development site at its nearest point.

There is also an active quarry site adjacent to the Proposed Development site. The operational Skrine Wind Farm is the closest existing wind farm development, located approximately 8.5km to the north and comprising of only two turbines.

The nearest existing grid infrastructure is an existing 110kV substation located in the townland of Monksland in Athlone County Roscommon, approximately 11.3km to the east/southeast of the Southern Cluster. Other existing grid infrastructure in the area includes an existing 110kV overhead line, located approximately 6.5km from the site at its nearest point, which runs from the substation at Monksland to the town of Roscommon to the north of the site.

3.2 Characteristics of the Proposed Development

3.2.1 Description of the project

This section of the Natura Impact Statement (NIS) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála, (the 'Proposed Development').

The Proposed Development comprises:

i. *20 no. wind turbines with an overall ground to blade tip height of 180 metres, a rotor dimeter of 162m and a hub height of 99m, associated foundations, hard-standing areas*
ii. *15 no. spoil storage areas at hardstands of turbines no. 1, 2, 3, 4, 5, 6 and 7 (in the townlands of Turrock, Gortaphuill, Cronin, and Tullyneeny) and turbines no. 8, 10, 11, 13, 14, 17, 19 and 20 (in the townlands of Milltown, Cuilleenoolagh, Cloonacaltry, Feacle and Tawnagh)*
iii. *Provision of 1 no. permanent meteorological mast with a maximum height of 100 metres for a period of 30 years from the date of commissioning of the entire wind farm*

iv. *Provision of 1 no. 110kV onsite substation in the townland of Cam, along with associated control buildings, MV switchgear building, associated electrical plant, associated security fencing, and equipment and wastewater holding tank*
v. *All underground electrical and communication cabling connecting the proposed wind turbines to the proposed onsite substation and associated control buildings and plant*
vi. *All works associated with the connection of the proposed wind farm to the national electricity grid via underground 110kV cabling from the site to the existing Athlone 110kV substation located in the townland of Monksland. Cabling will be placed within the public road corridor of the R362, R363 and L2047, or on private land*
vii. *Upgrade works to the existing 110kV Athlone substation consisting of the construction of an additional dedicated bay to facilitate connection of the cable*
viii. *Provision of 2 no. new site accesses north and south from the R363 and upgrade of 1 no. junction south of the R363*
ix. *Provision of new access tracks/roads and upgrade of existing access tracks/roads*
x. *7 no. overburden storage areas*
xi. *2 no. temporary construction compounds*
xii. *Site drainage works*
xiii. *Operational stage site signage*
xiv. *All associated site development works, apparatus and signage*

This application seeks a ten-year planning permission and a 30-year operational life from the date of commissioning of the Proposed Development.

All elements of the Proposed Development in the list above together with the entire turbine delivery route as described in this chapter have been assessed as part of this Natura Impact Statement (NIS).

The below subsections provide a description of the main infrastructure proposed as shown in the detailed design drawings (included as Appendix 7).

3.3 Development Layout

The layout of the Proposed Development has been designed to minimise the potential environmental effects of the wind farm, while at the same time maximising the energy yield of the wind resource passing over the site. A constraints study, provided as Appendix 8 to this NIS, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the site.

The overall layout of the Proposed Development is shown on Figure 3-2. This drawing shows the proposed locations of the wind turbines and all other associated infrastructure. Detailed site layout drawings of the Proposed Development are provided in full in Appendix 7 to this NIS.

3.3.1 Site setup

A suite of bespoke and site-specific environmental control measures has been incorporated into the design of the Proposed Development for the construction, operation and decommissioning phase of the Proposed Development. Measures for the protection of water quality have been incorporated into the initial site setup phase, including the installation and management of site compounds, fuel storage areas, material storage areas. These are fully described in the Construction Environmental Management Plan (CEMP) (Appendix 2 of this NIS), Section 9.5.2 of the detailed hydrological assessment (Appendix 3 of this NIS) and the project description above. These measures are summarised in Section 5.2.1 of this NIS. The measures to be implemented will ensure that there is no potential for water quality deterioration associated with site setup and construction.

3.4 Site Drainage

3.4.1 Introduction

The drainage design for the Proposed Development has been prepared by Malachy Walsh and Partners (MWP). The drainage design is a bespoke design and has been prepared based on the extensive experience of the project team of wind farm sites, and a number of best practice guidance.

Surface watercourses are absent within the Wind Farm site but are noted along the Grid Connection route. However, there are a number of turloughs noted within the low-lying areas of the Wind Farm site and wider area, with a number of turloughs situated within localised depressions. Further information on the local and regional hydrology of the Proposed Development site is detailed in Appendix 3.

There are 2 no. mapped Public Water Schemes (PWS) within 6km of the Proposed Development site (Mount Talbot PWS and Killeglan/Tobermore Spring PWS). The closest mapped domestic well by the GSI available through their public map viewer[1] is situated ~0.75km from the nearest turbine location. There are no other groundwater wells mapped by the GSI within the 50m accuracy threshold.

The protection of groundwater and surface water within and surrounding the site, and downstream catchments that they feed has been 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 and ensures minimal impact with regards the existing flow regime across the site, in particular having no negative impact on the water quality of the site 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. Watercourses are absent within the Wind Farm site, only occurring along the Grid Connection route, however potential impacts in relation to potential overland flow towards surface water bodies such as turloughs will nonetheless be mitigated against, as well as surface water runoff that will occur at site infrastructure that will need to be recharged locally into subsoils. This recharge water will occur close to source and can migrate vertically to groundwater below the site. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flow/recharge. All discharges (via groundwater recharge) from the proposed works areas will be made over vegetation filters at an appropriate distance from the works areas. Buffer zones around the existing natural drainage features (turloughs and karst features for the Wind Farm site) have been used to inform the layout of the Proposed Development.

Drainage controls at the Wind Farm site will be installed where significant cut and fill works are required. Elsewhere, the natural drainage/recharge regime will continue as that will cause the least disturbance and potential impacts to groundwater (note: this is how existing farm tracks within the Wind Farm site are drained currently).

Further details on the potential impact on the site drainage is detailed in the detailed Hydrological Assessment, included as Appendix 3 to this NIS, and in the Drainage Management Plan, included as Appendix 4.

3.4.2 Existing Drainage Features

The routes of any natural drainage features will not be altered as part of the Proposed Development. Infrastructure locations have been selected to avoid turloughs across the Wind Farm site. There will be no direct discharges to turloughs. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from turloughs. Where infrastructure is close to existing turlough 3 no. lines of Terrastop fencing shall be installed to provide

[1] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

additional settlement and filtration time to discharged water (such a scenario occurs at T4). This Terrastop fencing is shown on the relevant plan and detail drawings.

Where required, local overland drainage pathways in the vicinity of proposed works (including site roads and infrastructure locations) areas may have to be diverted around the proposed works areas to minimise the amount of water (after rainfall events) in the vicinity of works areas. These local drainage pathways will be blocked (using sandbags or silt fences) and overland flow water will be rerouted around works areas to downstream vegetation filters and designated recharge areas.

3.4.3 Drainage Design Principles

The drainage strategy for the Wind Farm site will ensure minimal impact on the existing flow regime, water quality, and run-off quantity. Drainage water from any works areas of the site of the Proposed Development will not be directed to any surface water features or turloughs within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean overland flow water clean by routing around works 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 for local recharge to ground.

3.4.4 Drainage Design

A detailed 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. The drainage design employs the various measures further described below.

3.4.4.1 Interceptor Drains (Clean Water Drain)

Interceptor drains will be installed upgradient of certain works areas to reroute overland flow 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 interceptor drains will be used to divert upslope overland flow around the works area to a location where it can be redistributed over the ground surface for recharge to local groundwater. 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 will remain in-situ. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with engineered fill, 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 overland flow to any significant extent that would result in scouring or over-topping or spill-over.

The velocity of flow in the interceptor will be controlled by check dams (see Section 3.4.4.3 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 predominantly installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains, pass through piped drains, and onto areas downgradient of works areas where the drain will terminate at a vegetation filter/level spreader (see Section 3.4.4.4 below).

3.4.4.2 Swales (Dirty Water Drain)

Drainage swales are drains that will be used to intercept and collect drainage water 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. They are similar in design to interceptor drains described above.

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.

3.4.4.3 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.

The proposed check dams will be made up of stone. Clean 4-6 inch stone will be built up on a layer of Terram and secured in place with pairs of stakes. A detail for this is shown on the design drawings.

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.

Check dams will not be used in any natural watercourses (as none exist at the Wind Farm site), only artificial drainage channels, interceptor drains and swales. 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.

3.4.4.4 Level Spreaders and Vegetation Filters

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse flow over areas of vegetated ground (i.e. vegetation filters acting as recharge areas). The levels spreaders/vegetation filters will be located downgradient of any proposed works areas where possible 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 (clean overland flow water) 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 re-concentrated 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.

3.4.4.5 Piped Drains

Piped drains will be used to convey drainage water from swales and interceptor drains safely downslope of the infrastructure. From here, water is dispersed through the level spreaders or to settlement ponds.

The piped 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 swales/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.

Piped drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockage.

3.4.4.6 Settlement Ponds

Settlement ponds will be used to slow down and treat drainage water 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 settlement ponds is to intercept drainage water 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 settlement ponds, before the drainage water is redistributed as diffuse sheet flow downgradient of any works areas for recharge to ground.

Settlement ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond as shown on the Drainage Drawing (see Appendix 4). The primary settlement pond will reduce the velocity of flows to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond over a stone weir, where further settlement takes place. Water will flow out of the secondary pond over a knife-edge weir, partially wrapped in 1000-gauge impermeable polythene, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the settlement pond system. The ponds are 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 at a 10 year Return Period. Treated drainage water from settlement ponds will be routed via swales to levelspreaders/vegetation filters where treated water will recharge into the ground downstream of works areas.

A water level indicator such as a staff gauge will be installed in each settlement pond with marks to identify when sediment is at 10% of the pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Settlement 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.

3.4.4.7 Silt Fences

Silt fencing will be used to manage drainage water. For example, they will be installed as a series of triple silt fences between works areas at T4 and Gortaphuill turlough.

Each fence will consist of a geotextile fabric such as Terrastop attached by staples to fixed stakes. The Terram sheets will be folded in an L shape with one metre extending horizontally in towards the works area. This horizontal section will be buried at a distance of approximately 150mm beneath the surface.

Site 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.

3.4.5 Overburden Storage Area

The drainage strategy at overburden storage areas is similar to that elsewhere on site, and that is to intercept clean water overland flow on the uphill side of the storage areas and convey it to the downhill side below the storage area for recharge to ground. A dirty water cut-off drain is provided below the storage areas to intercept any dirty water run-off before it makes its way to the clean water drainage network. This dirty water will be treated as per the remainder of dirty water generated on the wind farm, i.e. via settlement ponds, swales, levelspreader/vegetation filter and recharge to ground.

3.4.6 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 water 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 transported to one of the on-site overburden storage areas or 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 3.4.4.7, 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.

3.4.7 Site and Drainage Management

3.4.7.1 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 clean stone, terram, stakes, silt fencing, 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.

3.4.7.2 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. 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.

3.4.7.3 Reactive Site Drainage Management

The final drainage design prepared for the Proposed Development prior to commencement of construction will provide for adaptive management of drainage measures. The effectiveness of drainage measures designed to minimise overland flow entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Ecological Clerk of Works (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 project proceeds, 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/enhanced 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 the situation on the ground at a particular time.

In the event that works give rise to siltation of watercourses along the Grid Connection route, the ECoW or supervising hydrologist will immediately 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.

3.4.8 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. A Drainage Management Plan is included in Appendix 4, and drainage inspection and maintenance are detailed in the outline CEMP included as Appendix 2 to this NIS. 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 project to ensure 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.

A water level indicator such as a simple staff gauge or level marker will be installed to a number of silt traps with marks to identify when sediment is at 50% of the trap's capacity. Sediment will be cleaned out of the silt trap when it exceeds 10% of trap capacity. 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. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase up until the site has revegetated and the natural silt controls regenerate. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period.

3.5 Construction details

3.5.1 Turbine Foundations

Foundations for wind turbines may be of the gravity type. Each of the turbines to be erected on site will have a reinforced concrete base.

Where the foundation of the turbine is founded on competent strata, overburden will be stripped off the foundation area to a suitable formation using a 360º excavator and will be placed across the site as close to the excavation as practical. 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, although the proposed formation is already identified through the SI already completed. If the formation level is reached at a depth greater than the depth of the foundation, the ground level will be raised with Clause 6F2 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 be pumped to an adjacent settlement pond.

A berm 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 site in 2 or more parts depending on the turbine type. A 360º 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 steel float.

Once the base has sufficient curing time it will be filled with suitable fill up to existing ground level. The working area around the perimeter of the foundation will be backfilled with the original material that was excavated.

3.5.2 Site Roads and Crane Pad Areas

Site roads will be constructed to each turbine base and at each base hard standing will be constructed to the turbine manufacturer's specifications. Tracked excavators will carry out excavation for roads with appropriate equipment attached. The excavations shall follow a logical route working towards the proposed overburden storage areas. Excavated material will be contained within the site and transported to the designated overburden storage areas in haul trucks. A two- to three-metre-wide working area will be required around each hard standing area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. 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.

Where it is deemed acceptable owing to good ground conditions road construction will consist of a geogrid being laid on the existing ground surface and the road build-up being placed on top. No stripping of the surface will take place. This approach reduces the amount of spoil generated on the project. It is anticipated that this form of construction will be used in the majority of areas. In areas where the top surface may be softer formation level will be arrived at through stripping the topsoil and upper layer of overburden. When the formation layer has been reached, stone shall be placed on a geogrid to form the road foundation. The sub grade will be compacted with the use of a roller. The final wearing course will not be provided until all bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. The road will be upgraded prior to the arrival of the first turbine. All roads will be maintained for the duration of the operation of the Proposed Development.

3.5.3 Onsite Electricity Substation and Control Building

The proposed electricity substation will be constructed by the following methodology:

- The dimensions of the onsite electrical substation have been designed to meet the requirements of the ESB and EirGrid;
- Two buildings, Eirgrid control building and MV Switchgear Building, will be built within the onsite electrical substation compound;
- The area of the onsite electrical substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the proposed onsite overburden storage areas.
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix;
- The block work walls will be built up from the footings to damp proof course level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. 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 have been designed to ESB/Eirgrid specifications.
- The substation and buildings will be accessible from a dedicated access road which will connect to the R363 Regional Road to the north.

3.5.4 Temporary Construction Compounds

The temporary construction compounds will be constructed as follows:

- The area to be used as the compounds 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;
- The compounds platform will be established using a similar technique as the construction of the substation platform discussed above;
- A layer of geo-grid 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 compounds will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- The compounds will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compounds will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required.

3.5.5 Grid Connection

The proposed Wind Farm will be connected to the National Grid via a 110 kV underground cable from the proposed onsite electrical substation to the existing 110kV Athlone substation in Monksland, with a total cable length of approximately 11km.

The underground cabling will be a single circuit 110 kV connection, in accordance with the requirements and specifications of ESB. A single circuit connection typically consists of 3 no. 160mm diameter HDPE power cable ducts and 2 no. 125mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep. For trench designs there will be variations on the design to adapt to service crossings and watercourse crossings.

The power cable ducts will accommodate the power cables and the communications duct(s) will also accommodate a fibre cable(s) to allow communications between the Proposed Development substation and existing Athlone 110kV substation. The ducts will be installed, the trench reinstated in accordance with landowner or ESB specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 600m to 800m sections. Construction methodologies to be implemented and materials to be used will ensure that the underground cabling is installed in accordance with the requirements and specifications of ESB.

A full construction methodology of the proposed external Grid Connection is detailed below.

3.5.5.1 HV Cable Overview

A combination of trefoil trench width 825mm and standard flat formation total trench width 930mm will be used for most of the cable route. A fully flat formation trench width of 1330mm may be utilised on sections of the route where standard vertical trench depths cannot be achieved. Trenchless installation in the form of horizontal directional drilling (HDD) will be used at the following locations:

- Cross River Bridge on the R363;
- Cross River Bridge on the R362; and
- Under N6 adjacent to R362 Traffic Bridge.

For proposed cable route, joint bays are required approximately every 600m to 800m where separate cable lengths can be joined together. The joint bays proposed along the cable route will be located either within the existing road or at suitable off-road locations which will be immediately adjacent to

roadways to minimise traffic disruption. The selection of joint bay locations involved technical (including existing utilities, traffic management requirements and land ownership) and environmental evaluation of sites to ensure that the area is suitable for construction works and for safe access during any future maintenance. A working area is defined which provides adequate space for cable pulling and jointing around the joint bay. This working area will also provide space for movement of all construction vehicles. The working area will immediately adjoin the public road, as the cable will be diverted from the road to the joint bay.

All road works involving cable and pipe laying e.g., watermains, broadband, television etc., require traffic management procedures when installing within public roads. It may be a temporary requirement that some roads are closed along particular sections of the cable route. This can have a disruptive effect locally on residents over the period of the installation works. In the case of wider roads, one carriageway may be closed with use of the other carriageway restricted and controlled by temporary traffic lights or a "stop and go" traffic management system. The traffic management plan and corresponding works will be carried out with the agreement of the local authority.

3.5.5.2 Enabling Works

A preliminary site investigation has been completed to inform overall feasibility of the proposed route. The preliminary investigation included a series of slit trenches at potential conflict points and boreholes at proposed HDD locations. It is noted that further site investigations may be required to gather additional information on the road cover available over existing bridges and culverts with the relevant local authority approval.

3.5.5.3 Site Preparations

Prior to beginning construction work the contractor will scan the proposed route with a cable avoidance tool (CAT), carry out visual inspection of the area and may carryout out further below ground surveys if deemed necessary. If any previously unidentified services are discovered the site engineer will inform the design of the issues and possibly recommend a solution that works with the new constraints.

In some instances, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

If existing low voltage underground cables are found be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, the underground cables will then be re-energised.

In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

3.5.5.4 Trenching & Ducting

The proposed cable will be installed in a series of ducts in an excavated trench. Trenching will be achieved using a mechanical excavator. The top layer of soil or road surfacing will be removed and stockpiled separately for reuse. Material stockpiles should be stored at least 15 m back from drains and watercourses on level ground with a silt fence inserted at the base to prevent runoff.

The trench base will be graded and smoothed once the required depth and width is achieved. A layer of bedding material will be placed and compacted to the required specification on the trench floor prior to laying the ducts in trefoil formation.

The ducting surrounds will be carefully backfilled and compacted in accordance with the required specification. Cable protection strips will be placed on compacted material directly above the ducting. A secure cap will be placed at the end of each duct to prevent the ingress of dirt or water.

Ground water and surface water accumulating in the base of trenches will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

For concrete and asphalt/bitumen road sections, surfaces will be permanently reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities. All trench works carried out in public roadways will be carried out in accordance with 'Guidelines for Opening, Backfilling and Reinstatement of trenches in Public Roads' and any other conditions imposed by the relevant road authority.

For unsurfaced/grass sections, trenches will be backfilled with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner.

Ducting will be cleaned and tested in accordance with the specification by pulling through a brush and mandrel. A draw rope will be installed in each duct in preparation for cable installation at a later date.

3.5.5.5 Joint Bays

The location of joint bays have been selected to maximise each section length of cable and to satisfy electrical design requirements. The locations chosen by the designer are also determined by the density of existing services, likely disruption to traffic, requirements of utility specifications, space requirements for cable installation equipment.

For proposed cable route, joint bays are required approximately every 600m to 800m. The joint bay dimensions are approximately 6m long x 2.5m wide and 2m deep.

Where off-road joint bay locations are utilised, access tracks from the road to the joint bay locations will be constructed by stripping surface soils, placing geotextile reinforcement at subgrade level followed by a layer of granular material in accordance with the specification to form a working surface for vehicle. This surface will be regularly assessed for damage and additional aggregate added if required. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. Any surplus materials will be stockpiled separately for reuse or appropriate disposal, subject to validation and waste classification sampling.

Joint bay locations will be excavated using conventional mechanical excavators. Joint bay excavations will be advanced to the required depth and width with the excavation floor graded and smoothed. A blinding layer will be placed at the base of the excavation to facilitate the construction of a concrete base and side walls (in-situ or precast).

Ground water and surface water accumulating in the base of excavations will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

Where joint bays are located under the road surface the joint bay will be backfilled with compacted in accordance with the specification. Road surfaces may be temporarily reinstated as specified by the local

authority. Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.

3.5.5.6 Cable Installation

The installation of cabling normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer. Once the "two sections" of cable are pulled into the joint bay, a jointing container will be positioned over the joint bay and the cable jointing procedure carried out in this controlled environment.

Following the completion of jointing and duct sealing works in the joint bay, place and thoroughly compact cement-bound sand in approximately 200 mm layers to 100mm above the top of the cable joint base to provide vertical support. A cable protection strip will be installed at this depth and the joint bay backfilled with cement-bound sand and reinstated to match surrounding areas.

3.5.5.7 Trenchless Installation

Trenchless installation in the form of HDD will be used at the following locations:

- Cross River Bridge on the R363;
- Cross River Bridge on the R362; and
- R362 Traffic Bridge over M6.

HDD uses a special design drilling rig which initially bores a pilot hole through the ground along a pre-determined route.

Once completed, this pilot bore is then expanded as necessary using various sizes and types of back-reamers to enlarge the pilot bore to the required final diameter into which the cable will be installed. Two temporary pits (entry and exit) are excavated at each side of the HDD route, locations are selected based on drilling requirements including angle, depth, diameter, curvature, vertical clearance underneath water courses and structures, etc.).

Access to the entry and exit pits will be via a newly constructed temporary access or existing access road/track. Silt fences will be erected around the entire work area at both entry and exit pits prior to the drilling contractor preparing a laydown area. The works area will be a minimum of 15 m back from the river and within this zone, the natural vegetative cover will not be altered. If areas are overgrown with thick vegetation, a section of it will be removed appropriately and disposed of via a licensed waste contractor. The area is then levelled where required, levelled areas will be overlain with geotextile reinforcement and granular material in accordance with the specification to form access roads and temporary work platform. No material will be stored or stockpiled within 15m of water courses.

A pilot hole will be drilled from the entry pit through the overburden into the bedrock and travel underneath the riverbed before emerging through the overburden in the exit pit. The depth of the drill below the riverbed will be determined from site investigations. The drilled cuttings will be flushed to the surface through a closed loop mud circulation system with recycling capability to minimise the volume of fluids required on site.

Once the pilot hole has been completed, a larger drill bit will be used to ream the pilot hole to the required diameter to facilitate ducting installation. The ducts will be laid out on the exit side in preparation for installation. When the ducts are ready and the drill hole diameter has been proven, a towing assembly will be used to pull the ducts into the bore. The HDD ducts will be connected to the ducts which will have been installed in trenches at the entry and exit pits.

3.5.6 Site Underground Cabling

The transformer in each turbine is connected to the substation through a network of buried electrical cables. The ground is trenched typically using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The cables will be laid at a depth that meets relevant national and international requirements and will generally be approximately 1.2m below ground level; a suitable marking tape is installed between the cables and the surface. On completion, the ground will be reinstated. The route of the cable ducts will follow the access track to each turbine location and are shown on the site layout drawings included within Appendix 7.

It is proposed to connect the Northern Cluster of turbines to the proposed onsite electrical substation within the Southern Cluster of turbines via a section of underground IPP cabling measuring approximately 4.4km in length. Approximately 3.8km of the underground IPP cabling is located on existing roads, with the remaining 640m to be installed on agricultural land. The underground IPP cable to connect the two Clusters of turbines will be laid beneath the surface of the site and public road using the following typical methodology:

- The area where excavations are planned will be surveyed, prior to the commencement of works to confirm the conditions predicted in this EIAR, with a cable-avoiding tool and all existing underground services will be confirmed.
- Two teams consisting of two tracked excavators, two dumpers and a tractor and stone cart with side-shoot will dig the trench for and lay approximately 300m of the underground cable ducting per day.
- The excavators will open a trench at the edge of the road surface or on agricultural land as appropriate, the trench will be a maximum of approximately 450mm wide and 1,300mm deep.
- Clay plugs will be installed at 50m intervals to prevent the trench becoming a conduit for surface water runoff.
- Cable joint bays will be located at approximately 600-800m intervals or as otherwise required by the Electrical Designer along the proposed cable route, each joint bay will be approximately 4m long x 2m wide x 2m deep in size and will be located in the road edge and accessible for cable pulling and future maintenance.
- The excavated material will be assessed for suitability and may be used as backfill material in the trench, if it is unsuitable for this use, it will be loaded into a dumper to be transported to a designated overburden storage area.
- Once the trench has been excavated, a layer of bedding material will be installed and compacted to the required specification.
- The ducting along with marker strips will then be placed in the trench as per relevant specifications.
- The specified ducting surround will be installed to approximately 75mm above the cable ducting and compacted.
- The remainder of the trench will be backfilled with the excavated material and compacted. Where ducting is located within the access track i.e. road crossings, it will be backfilled with stone material and capped with clause 804 material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,
- 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.

3.5.7 Existing Underground Services

Any underground services encountered along the cable routes 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 a horizontal

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.

3.5.8 Joint Bays (Connection Chambers)

Joint bays are 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 800 m intervals or as otherwise required by the Electrical Designer.

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. 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.

3.5.9 Watercourse Crossings on Grid Connection and IPP Cable Route

The Wind Farm component of the Proposed Development will not require the crossing of any existing streams or watercourses. However, a total of 5 no. existing crossings will be crossed along the R363 Regional Road to cater for the proposed underground IPP cable route and external Grid Connection towards the existing Athlone 110 kV substation. The locations of the watercourse crossings are shown in the layout drawings in Appendix 7 of this NIS. The watercourse crossing methodologies for the provision of the underground Grid Connection component of the Proposed Development at these locations is set out below with the most appropriated option being selected for each crossing. Instream works are not required at any watercourse crossing along the proposed underground IPP cable route or Grid Connection route.

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

3.5.9.1 Crossing Using Standard Trefoil Formation – Option 1

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed, the standard ESB approved trefoil 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.

3.5.9.2 Flatbed Formation over Bridges/Culverts – Option 2

Where cable ducts are to be installed over an existing bridge/culvert crossing where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert or the depth of excavatable material over a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge or culvert has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per EirGrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of

the road, it may be necessary to raise the pavement level locally to fully cover the ducts. The increased road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench.

3.5.9.3 Horizontal Directional Drilling – Option 3

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5mm wide, 2.5m long and 2.0m 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 will 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 will 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, as listed below, 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 area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids shall 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.

3.6 Operation

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

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

Each turbine will be subject to a routine maintenance programme involving visits to undertake a number of checks and changing of consumables, including oil changes.

In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The onsite electrical substation and site tracks will also require periodic maintenance.

3.7 Decommissioning

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 30 years and ongoing research shows that this is likely to increase with improvements in turbine technology, site design and maintenance measures. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to fulfilment of planning requirements at that time, or the Proposed Development may be decommissioned fully. The onsite electrical substation will remain in place as it will be under the ownership of the ESB and will form a permanent part of the electricity grid.

Upon decommissioning of the Proposed Development, 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 would be used for their erection. The turbine will most 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. 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 environment emissions such as noise, dust and/or vibration.

Site roadways will be left in situ, as appropriate. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required. Underground cables will be removed and the ducting left in place.

A Decommissioning Plan has been prepared, the detail of which will be agreed with the local authority prior to any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will agreed with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

As noted in the Scottish Natural Heritage report (SNH) *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013) reinstatement proposals for a Wind Farm are made approximately 30 years in advance, so within the lifespan of the Wind Farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".

Map Legend

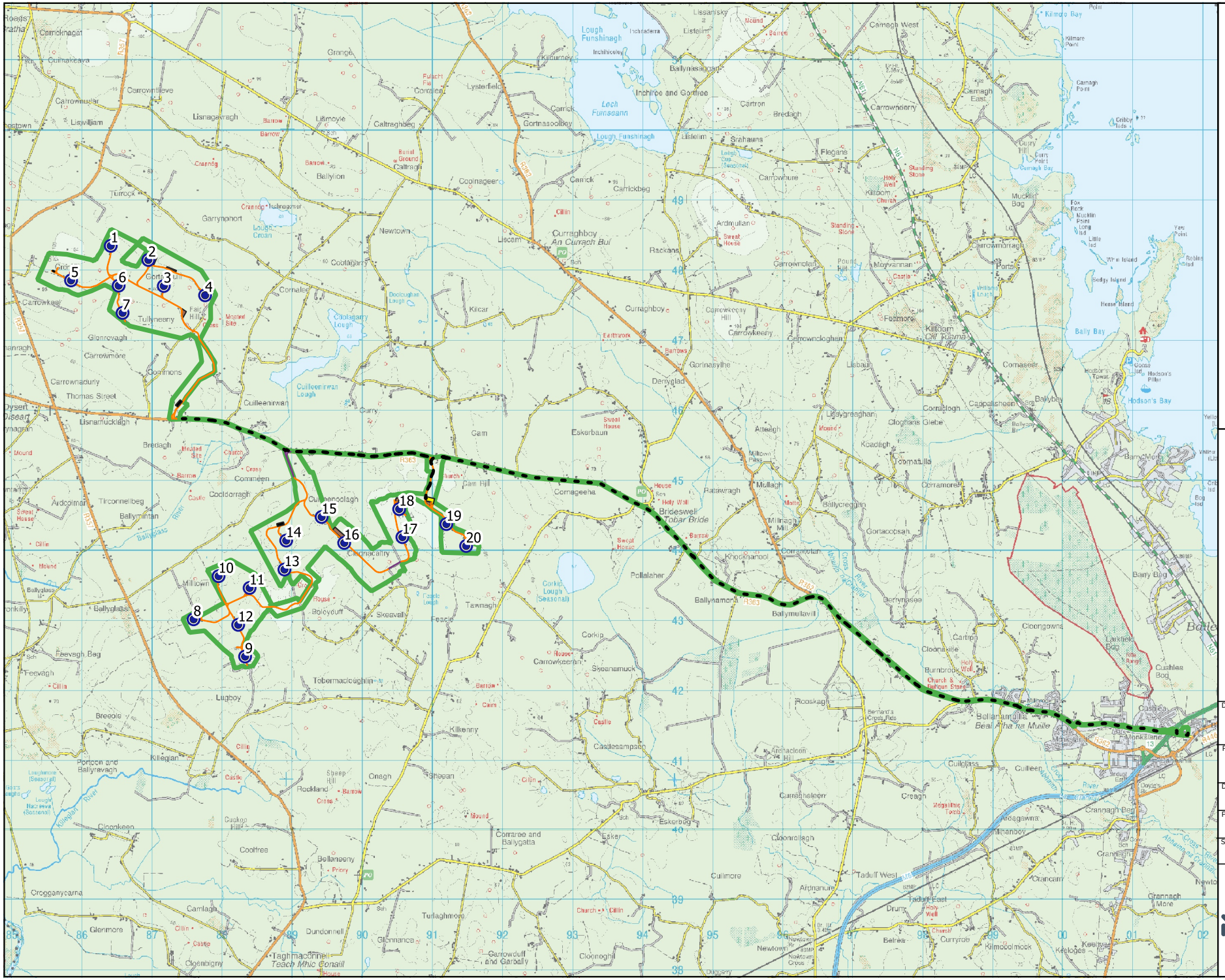
- EIAR Site Boundary
- Proposed Turbine Layout

Drawing Title

Site Location Map

Project Title: Seven Hills Wind Farm, Co Roscommon	
Drawn By: PE	Checked By: JH
Project No.: 190907	Figure No.: 3-1
Scale: 1:60000	Date: 2022-06-01

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



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstands
- Proposed Access Roads
- Proposed Upgrades to Existing Access Roads
- Proposed 110kV Substation Location
- Proposed Construction Compounds
- Proposed Met Mast Location
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas
- Proposed Connector Cabling and Grid Connection

N

Drawing Title

Proposed Layout

Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 3-2
Scale: 1:70500	Date: 01.06.2021

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

4. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

The ecological surveys of the Proposed Development site that were undertaken to inform this NIS are fully described in this section. 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 Ecological Multidisciplinary Walkover Surveys

Multidisciplinary ecological walkover surveys were conducted on the 13th June 2017, 14th August 2019, 15th August 2019, 02nd December 2019, 02nd July 2020 and the 03rd June 2021 in line with NRA (2009) guidelines (*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*). The surveys were conducted by by David McNicholas (B.Sc., M.Sc., MCIEEM), Katie Pender, (BSc.), Patrick Ellison (BSc., MSc., ACIEEM), Cathal Bergin (BSc) and Rudraksh Gupta (BSc., MSc). All habitats within and adjacent to the Proposed Development site were readily identifiable during the site visit. Habitats were identified 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).

4.1.2 Otter Survey

Although there are no watercourses within the Proposed Development site or in close proximity to the proposed infrastructure, the Grid Connection route does cross a number of watercourses. These were identified as providing potential habitat for otter and were subject to specialist targeted survey on the 24th September 2020, 30th March 2021 and during dedicated aquatic habitat surveys undertaken during September 2021.

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 Bird Surveys

4.1.3.1 Current Survey Data

Baseline ornithology surveys were conducted during the period October 2018 to September 2021 and were carried out in accordance with the relevant NatureScot (formerly SNH) Guidance (SNH 2017).

[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*

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).

4.1.3.1.1 Flight Activity Surveys

Surveys at both the Northern and Southern Clusters commenced in October 2018 and continued until September 2021. As per guidance a minimum of thirty-six hours of flight activity surveys were conducted from each of two VP locations at the Northern Cluster and each of four VP locations at the Southern Cluster during each non-breeding and breeding season. VP locations were chosen according to NatureScot guidance (SNH, 2017), i.e., the VPs were chosen to given the highest visibility of the Proposed Development plus a 500 m buffer from the minimum number of VP locations. More VPs were required to achieve maximum visibility of the Southern Cluster due to the larger size of the Cluster and due to topographical constraints.

The number of hours completed at each VP at the northern and Southern Clusters, in each season, is summarised in Tables 4-1 and 4-2 and for the Northern and Southern Clusters respectively.

Table 4-1 Northern Cluster VP Survey Hours (Hrs:Mins)

VP	2018-19 (Oct-Mar)	2019 (Apr-Sept)	2019-20 (Oct-Mar)	2020 (Apr-Sept)	2020-21 (Oct-Mar)	2021 (Apr-Sept)
1	36:00	36:00	42:00	36:00	36:00	36:00
2	36:00	36:00	42:00	36:00	36:00	36:00

Table 4-2 Southern Cluster VP Survey Hours (Hrs:Mins)

VP	2018-19 (Oct-Mar)	2019 (Apr-Sept)	2019-20 (Oct-Mar)	2020 (Apr-Sept)	2020-21 (Oct-Mar)	2021 (Apr-Sept)
1	36:00	36:00	42:00	36:00	36:00	36:00
2	36:00	36:00	42:00	36:00	36:00	36:00
3	36:00	36:00	42:00	36:00	36:00	36:00
4	36:00	36:00	42:00	36:00	36:00	36:00

4.1.3.1.2 Breeding Wader Surveys

Surveys were undertaken in 2019, 2020 and 2021 within the Southern Cluster plus a 500 m buffer zone beyond the turbine Cluster and infrastructure boundary as recommended by NatureScot (SNH, 2017) guidance, using the methodology described in O'Brien and Smith (1992) which is suitable for lowland grassland sites. Three survey visits were undertaken in each year in April, May and June.

As the habitat within the Northern Cluster is not suitable for breeding waders (consisting predominantly of improved agricultural grasslands used for cattle grazing), surveys were not considered necessary there.

4.1.3.1.3 Breeding Raptor Surveys

The survey methodology for breeding raptors in 2019, 2020 and 2021 used a driven transect with regular stops, to carry out watches of potentially suitable habitat from appropriate viewpoints to identify potential nesting territories. Survey timings followed those in Hardey *et al.* (2013), as per current NatureScot guidelines. Surveys were repeated along the same route monthly from April to July inclusive in 2019 and 2020. A driven survey was used due to limitations to access to third party land within the 2 km buffer zone (this survey area follows current NatureScot guidelines) and the availability of a good road network in the vicinity of the site. Suitable breeding habitat for Annex 1 raptors within the two Clusters (i.e. the Northern and the Southern Cluster) that together comprise the Proposed Development site, and 2 km buffer was very limited and visibility from the survey route was sufficient to cover the vast majority of potentially suitable breeding habitat within the survey area.

4.1.3.1.4 Swan and Goose Feeding Distribution Surveys

As the survey area lies within the core foraging distance[3] of SPAs for whooper swan and Greenland white–fronted goose, current NatureScot guidelines recommend that feeding distribution surveys should be undertaken, unless it can be established from existing data that the area is not utilised for feeding.

Feeding distribution surveys were carried out on at least a monthly basis each winter to establish whether swans and geese were using fields within 1 km of the EIAR Site Boundary. A buffer of 1 km around all turbines and site infrastructure combined across Northern and Southern Clusters was used for these surveys which were undertaken by driven transect, stopping on a regular basis to check all fields for goose and swan feeding activity. This buffer was more than the current 500 m buffer recommended by NatureScot (SNH, 2017), which helped to identify whether swans or geese were feeding in areas between the two Clusters. Monthly surveys were undertaken during October to March inclusive in 2018/19 and 2019/20, and surveys were undertaken fortnightly in 2020/21.

4.1.3.1.5 Greenland White-fronted Goose Roost Surveys

Surveys for roosting Greenland white-fronted geese were undertaken monthly from December 2019 to March 2020 inclusive and were repeated on a monthly basis[4] from October 2020 to March 2021. These surveys were added to the scope following the provision of information by Birdwatch Ireland in late 2019, which revealed evidence of roosting Greenland white-fronted geese at some of the waterbodies in the vicinity of the site. The data provided, along with current survey data, indicated that surveys should focus on Lough Croan which lies approximately 1.5 km north of the Northern Cluster (see survey reports in Appendix 5 for further details).

Surveys of Lough Croan were carried out simultaneously from two vantage points on the local road north of Lough Croan. The watches were carried out at dusk and the following dawn each month for a duration of up to 2 hours depending on the levels of light. The dawn watches began at civil twilight i.e., 30 minutes before the time of sunrise and continued for up to 1.5 hours after sunrise. The dusk watches ended at civil twilight i.e., starting up to 1.5 hours before the time of sunset and continued for 30 minutes after sunset. All flight-lines of Greenland white-fronted geese to and from the turlough, in addition to the direction of flight and the number of birds, were recorded during watches.

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[3] The core foraging range refers to the distance regularly travelled by a bird to forage. As per current NatureScot (SNH, 2016) guidance, this distance should be used when determining whether there is connectivity between the proposal and the qualifying interests of an SPA. The core foraging range for whooper swan is <5 km, the core foraging range for Greenland white-fronted goose is 5-8 km.

[4] As the available evidence suggested that the nearest known roost site was > 1 km from the nearest wind farm infrastructure, monthly roost surveys (dusk and dawn) for geese were judged to be sufficient, as per current NatureScot (SNH, 2017) guidance.

4.1.3.1.6 European Golden Plover Nocturnal Foraging Surveys

Due to the presence of European golden plover during daytime surveys in winter 2018-19, additional surveys were carried out in winter 2019-20 to determine whether European golden plover activity was significantly different at night.

Pre-defined transects were walked at night on three occasions between January and March 2020. The purpose of the survey was to identify if European golden plover (or other waterbird species, e.g. Northern lapwing) uses the site for foraging at night. The habitats at the Southern Cluster were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night. Therefore, the transects were focused on the Northern Cluster where all proposed turbine locations and associated access tracks were walked after dark by two surveyors. A high-powered torch was used by one surveyor to slowly sweep across the landscape, while a second surveyor used binoculars to spot any birds visible in the torchlight. Any foraging European golden plover flushed while the surveyors were walking the transect route were also recorded. In the absence of survey data for the Southern Cluster a precautionary approach has been adopted which assumes that it is used in a similar way to the Northern Cluster by European golden plovers at night, despite the less suitable habitat.

Given the very small number of birds recorded (see Section 4.2.2.2 and Appendix 5 for survey results) and the difficulties undertaking this survey (see above) nocturnal surveys were not repeated in winter 2020-21.

4.1.3.2 Pre-existing Survey Data

Survey information relating to previous planning applications at Seven Hills in 2010 and 2012 was reviewed and summarised in the baseline ornithological survey reports (Appendix 5). In addition, the review included more recent survey reports which were produced after the submission of the previous planning applications. Winter bird surveys were undertaken at the Northern and Southern Clusters during the winter seasons of 2008/09, 2009/10, 2011/12, 2014/15, 2016/17 and 2017/18. Previous breeding season data are limited to the period April to June 2009.

The pre-existing data provide useful context and helped identify what species were likely to be present and the survey methodology that was required. However, given their age (NatureScot (SNH, 2017) guidelines state that data older than five years should not be used for impact assessment) and the differences in the methods used they have not been used to inform the assessment presented in this report, which is instead based on the survey data collected between winter 2018-19 and the breeding season in 2021, as summarised in Section 4.1.3.1.

4.2 Ecological Survey results

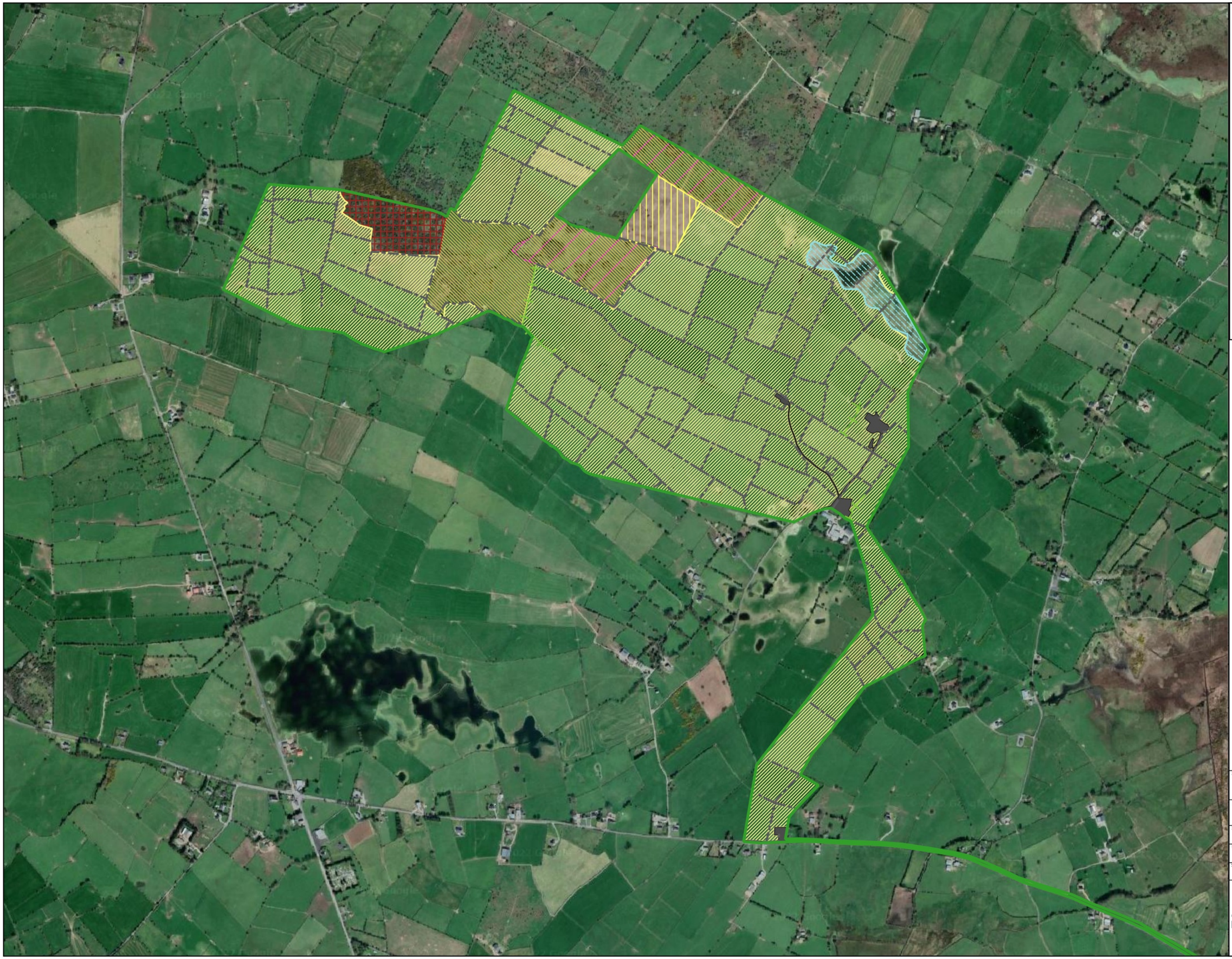
4.2.1 Habitats within the Proposed Development Site Boundary

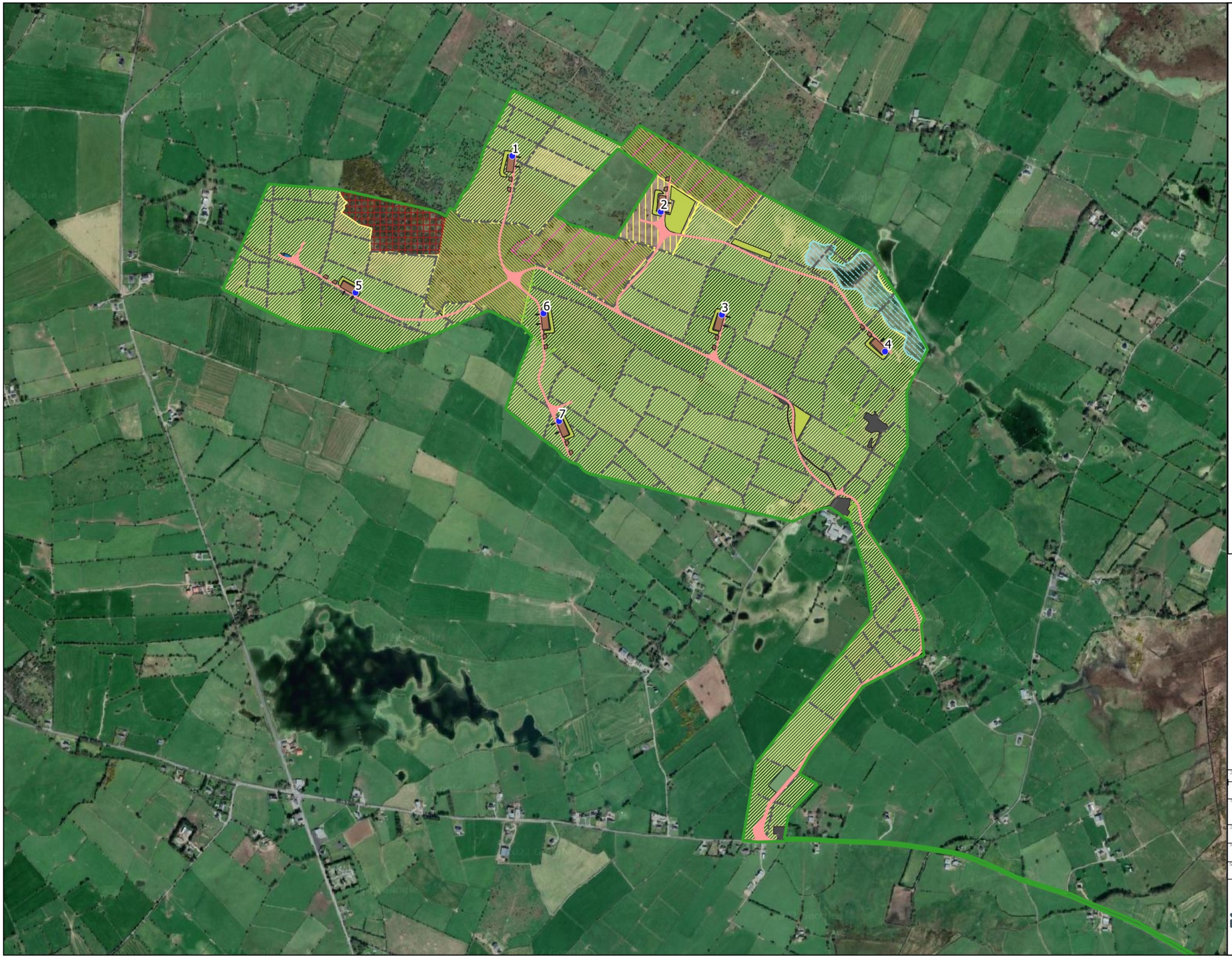
A total of twelve habitats were recorded within the Proposed Development site, including;

- Improved agricultural grassland (GA1)
- Dry calcareous and neutral grassland (GS1)
- Wet grassland (GS4)
- Scrub (WS1)
- Arable land (BC1)
- Turloughs (FL6)
- Stone walls (BL1)

- Hedgerows (WL1)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)
- Buildings and Artificial Surfaces (BL3)

Grassland habitats have been categorised to plant communities following the Irish Vegetation Classification (IVC). Habitat maps of the site are provided in Figures 4.1 – 4.4.


Map Legend
EIAR Site Boundary
Arable crops
Stone walls and other stonework
Buildings and artificial surfaces
Spoil and bare ground
Recolonising bare ground
Turloughs
Improved agricultural grassland
Scrub
Areas of Annex 1 Prioirty Grassland
Hedgerows
Stone walls
Microsoft product screen shots reprinted with permission from Microsoft Corporation
N
Drawing Title
Habitat Map - Northern CLuster
Project Title
Seven Hills Wind Farm, Co. Roscommon
Drawn By
PE
Checked By
JH
Project No.
190907
Figure No.
4-1
Scale
1:12000
Date
2022-06-01
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
Website: www.mkoireland.ie



Map Legend

- EIAR Site Boundary
- Arable crops
- Stone walls and other stonework
- Buildings and artificial surfaces
- Spoil and bare ground
- Recolonising bare ground
- Turloughs
- Improved agricultural grassland
- Scrub
- Areas of Annex 1 Prioirty Grassland
- Hedgerows
- Stone walls
- Turbine Locations
- Proposed Hardstands
- Proposed Substation Location
- Proposed Spoil Storage Areas
- Infrastructure Spoil Storage Areas
- Met Mast Location
- Proposed Construction Compound
- Proposed Access Roads

N

Drawing Title: Habitat Map - Northern Cluster w/ Proposed Development

Project Title: Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
PE	JH
Project No.	Figure No.
190907	4-2
Scale	Date
1:12000	2022-06-01

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

Map Legend

- EIAR Site Boundary
- Extended Survey Area
- Arable crops
- Stone walls and other stonework
- Buildings and artificial surfaces
- Spoil and bare ground
- Recolonising bare ground
- Turloughs
- Improved agricultural grassland
- Scrub
- Areas of Annex 1 Priority Grassland
- Hedgerows
- Stone walls

N

Drawing Title: Habitat Map - Northern CLuster

Project Title: Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
PE	JH
Project No.	Figure No.
190907	4-3
Scale	Date
1:13000	2022-06-01

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

Map Legend

- EIAR Site Boundary
- Extended Survey Area
- Arable crops
- Stone walls and other stonework
- Buildings and artificial surfaces
- Spoil and bare ground
- Recolonising bare ground
- Turloughs
- Improved agricultural grassland
- Scrub
- Areas of Annex 1 Priority Grassland
- Hedgerows
- Stone walls
- Turbine Locations
- Proposed Hardstands
- Proposed Substation Location
- Proposed Spoil Storage Areas
- Infrastructure Spoil Storage Areas
- Met Mast Location
- Proposed Construction Compound
- Proposed Access Roads

N

Drawing Title: Habitat Map - Northern CLuster

Project Title: Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
PE	JH
Project No.	Figure No.
190907	4-4
Scale	Date
1:13000	2022-06-01

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

4.2.1.1 Grassland habitats

Grasslands makes up a significant proportion of the habitats within the site of the Proposed Development; it comprises large areas of improved agricultural grassland (GA1) and Dry calcareous and neutral grassland (GS1), with small areas of Wet grassland (GS4) associated with Turloughs where they are subject to long periods of groundwater inundation. Detailed botanical quadrat data was recorded on site in the form of relevés taken at specific locations within the site (see Methodology in Section 4.1.1). The botanical data from all relevés was uploaded to the National Biodiversity Data Centre (NBDC) online habitat classification system ERICA[5].

4.2.1.1.1 *Improved agricultural grassland (GA1)*

The areas of improved agricultural grassland (GA1) have primarily been intensively managed for sheep and cattle grazing, and many of the fields surveyed have been reseeded with perennial ryegrass (*Lolium perenne*), see Plate 4-1. These grasslands have been assessed as of local importance (lower value) as they are highly managed. Turbines T1- T8, T11, T13-T15 and T17-T20 the site compounds, substation and the majority of the internal site access tracks are located within this habitat. The NBDC online habitat classification system ERICA classified the areas of improved agricultural grassland as conforming to the Yorkshire-fog – Perennial Rye-grass grassland (GL2C), Yorkshire-fog – Perennial Rye-grass grassland (GL2C) and in some areas the Annual Meadow-grass – Greater Plantain weed community (WE1E) community. These are species-poor grassland communities with low conservation value.

Plate 4-1 Example of improved agricultural grassland occurring within the vicinity of Turbine no. T4.

4.2.1.1.2 *Dry calcareous and neutral grassland (GS1)*

Areas of Dry calcareous and neutral grassland (GS1) comprise of a mix of both semi-natural and semi-improved grasslands. Some areas mapped as Dry calcareous and neutral grassland (GS1) have been subject to intensive grazing, primarily sheep and cattle grazing, see Plate 4-2. Turbines no. T9, T10, part of T12, part of T16, and a number of proposed site access roads occur within this habitat. The calcareous grassland subject to intensive sheep and cattle grazing is dominated by sweet vernal-grass

[5] *Engine for Relevés to Irish Communities Assignment*

(*Anthoxanthum odoratum*), meadow fox-tail (*Alopecurus pratensis*), annual meadow-grass (*Poa annua*), red fescue (*Festuca rubra*), Yorkshire fog and some perennial ryegrass, with herbs including yarrow (*Achillea millefolium*), white clover (*Trifolium repens*), common sorrel (*Rumex acetosa*), daisy (*Bellis perennis*), ribwort plantain (*Plantago lanceolata*), creeping buttercup (*Ranunculus repens*) and bulbous buttercup (*Ranunculus bulbosus*) common throughout.

Plate 4-2 Example of improved Dry calcareous and neutral grassland (GS1), although containing many herb species

The areas of Dry calcareous and neutral grassland (GS1) not subject to agricultural improvement also occur in association with patches of scrub and limestone boulders, see Plate 4-3. Elements of the Proposed Development infrastructure including turbines T2 T9, T10, T12, T13 & T16 and some associated site access tracks are all or partially located within this habitat (see Figures 4.3 and 4.4). This grassland is species rich and of high biodiversity value. The grassland comprises of crested dog's tail (*Cynosurus cristatus*), Yorkshire fog (*Holcus lanatus*), cock's foot grass (*Dactylis glomerata*), rough meadow-grass (*Poa trivialis*) with a rich herb layer comprising mainly of yarrow (*Achillea millefolium*), ribwort plantain (*Plantago lanceolata*), rough hawkbit (*Leontodon hispidus*) and lady's bedstraw (*Galium verum*). Other species typical of this calcareous limestone boulder habitat include mountain everlasting (*Antennaria dioica*), carline thistle (*Carlina vulgaris*), primrose (*Primula vulgaris*), wild thyme (*Thymus polytrichus*), spring sedge (*Carex caryophyllea*), glaucous sedge (*Carex flacca*), bird's foot-trefoil (*Lotus corniculatus*) and cat's-ear (*Hypochaeris radicata*). The bryophyte layer within the grassland include *Ctenidium molluscum*, *Rhytidiadelphus squarrosus, Rhytidiadelphus loreus and Hylocomium splendens.* The surveys identified a variety of orchid species including early purple orchid (*Orchis mascula*), common spotted orchid (*Dactylorhiza fuchsii subsp. Fuchsia*), fragrant orchid (*Gymnadenia conopsea*) and a single individual autumn ladies tresses orchid (*Spiranthes spiralis*) north-west of T9, see Plate 6-5. These species are typical of the Annex I habitat Calcareous grassland (*orchid-rich) [6210] and the site contains an extensive population of early purple orchid (*Orchis mascula*)[6], see Plate 6-4. The grassland also supports a wide diversity of fungi species, see Section 6.6.2.1.7, with yellow meadow ant (*Lasius flavus*) hills common throughout. Such ant hill features provide a microclimate of well drained soils that are in turn covered by wild thyme and bird's foot-trefoil. Where the grassland occurs in association with scrub habitat, other species typical of this habitat

*[6] This is based on the Irish Wildlife Manual (Martin et al., 2019[6]) guidance which states that the 6210 grassland habitat "is considered a priority habitat only if it is an important orchid site" [*6210]. O'Neill et al., (2013) states that "if the 6210 grassland has a population of any orchid species other than the relatively common Dactylorhiza fuchsii and Dactylorhiza maculata it should be considered for the orchid-rich priority[6] habitat *6210".*

transition occur including, wood-sorrel (*Oxalis acetosella*), bramble (*Rubus fruticosus*), lords and ladies (*Arum maculatum*) and bluebell (*Hyacinthoides non-scripta*).

Using the ERICA classification system the majority of the relevés taken in unimproved semi-natural dry calcareous grasslands (GA1) conformed to the community type 'Quaking-grass – Wild Thyme grassland' (GL3A). This community type has a high affinity (92%) with the Annex I Calcareous grassland [6210] Orchid-rich calcareous grassland*[7] (Perrin, 2016a[8]). Some areas corresponded to the Crested Dog's-tail – Red Clover grassland (GL3D) community, which also has an affinity with the Annex I 6210 Orchid-rich calcareous grassland* (20.7%) (Perrin, 2016a).

Plate 4-3 Example of limestone boulders occurring within the Annex I habitat Calcareous grassland [6210].*

In some areas, ling heather (*Calluna vulgaris*) is frequent. However, these areas still conformed to the 'Quaking-grass – Wild Thyme grassland' (GL3A) community. Some areas dominated by dense bramble and blackthorn scrub also contained dense bracken, likely associated with changes in agricultural management.

4.2.1.1.3 Scrub (WS1)

Given the extent of low intensity managed seminatural grassland habitat occurring within the study area, scrub (WS1) habitat occurs in association with much of this grassland habitat, generally as an intimate mosaic, see Plate 4-4. Blackthorn and hawthorn are a constant feature of the semi-natural grassland habitat, see Plate 4-4; where coverage of shrubs did not exceed 25% this was mapped as grassland which corresponded to the Annex I habitat Calcareous grassland (*orchid-rich) [6210]. In some areas, hazel dominated scrub occurs, resulting in a herb rich ground layer dominated by primrose, wood-sorrel (*Oxalis acetosella*), common dog violet (*Viola riviniana)*, wild strawberry (*Fragaria vesca*) and some early purple orchids, see Plate 4-5. These areas also comprise of significant mosses cover including *Thamnobryum alopecurum*, *Thuidium tamariscinum* and *Rhytidiadelphus loreus*. No development infrastructure is proposed within areas mapped as scrub in Figures 4-1-4.4.

[7] *[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)*
[8] *Perrin 2016a, Community Synopsis; Briza media – Thymus polytrichus grassland GL3A, Synopsis version: V1.0, Online, Available at: https://www.biodiversityireland.ie/wordpress/wp-content/uploads/GL3A.pdf, Accessed, 19.04.2021*

Note, as per Calaciura & Spinelli (2008)[9], "*Scrub and woody vegetation, which develops with the relaxation of management, are also considered part of the 6210*[10] *habitat*". Therefore, where scrub habitat occurs in an intimate mosaic with the Annex I habitat semi-natural dry grasslands and scrubland facies on calcareous substrates [6210], it is mapped and assessed under this habitat.

Plate 4-4 Example of scattered scrub (background) and hazel dominated scrub (middle ground) throughout the semi-natural grassland on site.

[9] *Olmeda C., Šefferová V., Underwood E., Millan L., Gil T. and Naumann S. (compilers). EU Action plan to maintain and restore to favourable conservation status the habitat type 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (FestucoBrometalia) (*important orchid sites). European Commission Technical Report XXXX-2019*

[10]

Plate 4-5 Example of herb rich ground layer occurring within hazel dominated scrub

4.2.1.2 Arable land (BC1)

A number of fields within the site of the Proposed Development have been used for arable crop production, generally oats. Turbine T2 and areas of proposed site access roads are located within this habitat. Among the arable dominated sward, other species recorded included annual meadow grass (*Poa annua*), pineappleweed (*Matricaria discoidea*) and redshank (*Persicaria maculosa*). An example of this habitat is provided in Plate 4-6.

Plate 4-6 Example of arable crop occurring within the EIAR study area boundary.

4.2.1.3 Turloughs (FL6)

"*Turloughs are ephemeral lakes that occupy basins or depressions in limestone areas*" (Fossitt, 2000). The lands around the Feacle Lough/Turlough (FL6) are largely improved and species poor, see Plates 4-7 and 4-8. However, areas subject to prolonged water inundation comprise of wet grassland (GS4) with species such as silverweed (*Potentilla anserina*), creeping buttercup (*Ranunculus repens*) dominant and in the wettest areas or where permanent standing water remains, floating sweet-grass (*Glyceria fluitans*) occurs.

Plate 4-7 Feacle Lough, a large Turlough (FL6) located to the southeast of the site

Plate 4-8 Example photo of the northern extent of Feacle Lough/Turlough which dries out in the summer months and is managed as pasture.

4.2.1.4 Stone walls (BL1)

Stone walls (BL1) are the dominant boundary feature within the Proposed Development Site given the nature of the boulder strewn landscape, see Plate 4-9. In places, these stone walls have become enveloped by bramble and some lined with blackthorn, hawthorn or hazel.

Plate 4-9 Example of stone walls occurring within the study area.

4.2.1.5 Hedgerows (WL1)

Hedgerows (WL1) occur throughout the study area, usually in association with stone walls, see Plate 4-10. Hedgerows are largely dominated by blackthorn (*Prunus spinosa*) or hawthorn (*Crataegus monogyna*) and in some areas hazel (*Corylus avellana*). Bramble dominated the understory in places, and on occasion bracken (*Pteridium aquilinum*). Other species occurring within the hedgerow understory include lesser celandine (*Ficaria verna),* primrose (*Primula vulgaris*), cleavers (*Galium aparine*) and mosses including *Rhytidiadelphus squarrosus* and *Thuidium tamariscinum* also occur.

Plate 4-10 Example of hedgerow habitat occurring within the study area dominate by hawthorn.

4.2.1.6 Spoil and bare ground (ED2)

Unbound farm tracks occur in some small areas and were categorised as Spoil and bare ground (ED2), see Plate 4-11. Species recorded comprised mainly of sweet vernal grass (*Anthoxanthum odoratum*), daisy (*Bellis perennis*), dandelion (*Taraxacum officinale* agg.) and colt's-foot (*Tussilago farfara*).

Plate 4-11 Example of existing unbound track categorised as Spoil and bare ground (ED2)

4.2.1.7 Recolonising bare ground (ED3)

Some farm tracks occurring through areas of rough semi-improved grassland contain small areas of recolonising bare ground (ED3), see Plate 4-12. They tend to be recolonised by the abundant species occurring adjacent including red fescue, cocks foot grass, ribwort plantain and creeping thistle initially.

Plate 4-12 Example of existing agricultural access track through rough semi-natural grassland

4.2.1.8 Buildings and Artificial Surfaces (BL3)

There are some farm buildings within the Proposed Development site which comprised of agricultural sheds. These were categorised as Buildings and artificial surfaces (BL3), see Plates 4-13.

Plate 4-13 Example of an agricultural building categorised as Buildings and artificial surfaces (BL3)

4.2.1.9 Habitats along the Grid Connection route

The majority of the Grid Connection route is located within the public road and measures approximately 11km in total. The proposed Grid Connection will leave the site of the Proposed Development to the north of Turbine no. 18 and 19, initially passing through a short section of existing access track, categorised as Buildings and Artificial Surfaces (BL1), before joining the R363, also categorised as Buildings and artificial surfaces (ED2). The underground cable route runs along the R363 and, after transitioning to the R362 near the townland of Ballymullavill, will travel north along the L2047 before reaching the Athlone 110 kV substation at Monksland. Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed.

Plate 4-14 Example of the existing R363 in which part of the Grid Connection is to be located, categorised as Buildings and artificial surfaces (ED2).

A number of watercourses (classified as Eroding/upland rivers (FW1)) occur along the proposed Grid Connection route. No watercourses occur within close proximity to any of the proposed turbine infrastructure. Watercourses were generally fast flowing with a coble substrate, see Plate 6-12. The bank side vegetation was dominated by bramble and ivy, with some Hart's-tongue fern (*Asplenium scolopendrium*), nettle and hedge bindweed (*Calystegia sepium*) also a common component throughout.

Plate 4-15 Example photo of the Ballyglass River (FW1) occurring on the Grid Connection route along the R363

4.2.1.10 Protected Flora

No botanical species listed under the Flora (protection) Order (1999, as amended 2015), listed in the EU Habitats Directive (92/43/EEC), or listed in the Irish Red Data Books were recorded on the site. The species recorded are generally common in the Irish landscape. A single autumn lady's-tresses orchid (*Spiranthes spiralis*), recorded at one location (grid ref: 53.433275, -8.177963) over 60 metres to the west of the proposed access track to Turbine no. T10 and over 120 metres from the proposed turbine base, is assessed as "near threatened"[11].

4.2.1.11 Invasive species

During field surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the SI 477 European Communities (Birds and Natural Habitats) Regulations 2011, as amended was conducted. No invasive species listed under the Third Schedule of SI 477 European Communities (Birds and Natural Habitats) Regulations 2011, as amended were recorded within the Wind Farm site or along the Grid Connection route.

4.2.1.12 Evaluation of habitats

4.2.1.12.1 *Grassland habitats*

Vegetation surveys undertaken between May and September 2020 found that the majority of the of the relevés taken within areas of semi-natural Dry calcareous and neutral grassland (GS1) confirmed to the

[11] *As per the International Union for the Conservation of Nature (IUCN) and described for Ireland in Nelson, B., Cummins, S., Fay, L., Jeffrey, R., Kelly, S., Kingston, N., Lockhart, N., Marnell, F., Tierney, D. and Wyse Jackson, M. (2019) Checklists of protected and threatened species in Ireland. Irish Wildlife Manuals, No. 116. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.*

IVC community GL3A *Briza media-Thymus polytrichus*. As per the NPWS (2019)[12] Article 17 report, the Calcareous grassland (*orchid-rich) [6210] habitat '*is comprised of a diverse group of plant communities belonging to the Bromion-erecti, including GL3A Briza media-Thymus polytrichus grassland (Perrin, 2018)'.*

In addition, the assessment took account of the Irish Wildlife Manual (Martin *et al.,* 2019[13]) guidance which states that the Annex I Calcareous grassland [6210] habitat '*is considered a priority habitat only if it is an important orchid site*' [*6210]. O'Neill *et al.,* (2013) states that '*if the 6210 grassland has a population of any orchid species other than the relatively common Dactylorhiza fuchsii and Dactylorhiza maculata it should be considered for the orchid-rich priority*[14] habitat *6210'. Following botanical surveys undertaken between May and September 2020, a significant population of early-purple orchid (*Orchis mascula*) was recorded within much of the Calcareous grassland [6210*]. Some areas had as many as one per metre squared. Areas that correspond to priority habitat [6210*] (orchid rich sites) have been identified as of *Internationally important* (NRA, 2009). This is due to the fact that these areas contain extensive areas of the habitat types listed in Annex I of the Habitats Directive (NRA, 2009).

Calcareous grassland that was identified as corresponding to the non-priority variant [6210] i.e. an absence of orchid species or presence of *Dactylorhiza fuchsia* only, have been evaluated as of *National importance*. This is due to the extensive areas of this habitat and the fact that it occurs as an intimate mosaic with the priority habitat [6210*]. Although some areas of the Annex I Calcareous grassland [6210] habitat did not always contain the required diversity of typical plant assemblages in all areas, largely due to intensifying grazing regimes or alterations/abandonment in agricultural management or the presence of negative indicator species, these areas were assessed as still conforming to the Annex I habitat although in bad condition.

4.2.1.12.2 Eroding/upland rivers (FW1) and associated aquatic habitats and related species

The only watercourses occurring within the study area are those occurring along the Grid Connection route i.e. tributaries of the Ballyglass and Cross Rivers. These watercourses i.e. small streams, have been assigned Local importance (Higher Value) as they are of high biodiversity value in a local context and connect to downstream waterbodies in the local area.

4.2.1.12.3 Turloughs

Turloughs "*are virtually unique to Ireland and their greatest concentration is in counties Clare, Galway and Roscommon*" (Fossitt, 2000). Turloughs are also assigned priority status under the Habitats Directive (NRA, 2009) and have therefore been assessed as of *National importance*.

4.2.1.12.4 Scrub (WS1)

Scrub habitat within the site is largely dominated by patches of blackthorn and hawthorn, although areas dominated by hazel or gorse scrub also occur throughout the study area. This habitat is of local importance to local wildlife (NRA, 2009). Where the habitat occurs in an intimate mosaic with the Annex I habitat semi-natural dry grasslands and scrubland facies on calcareous substrates [6210], it is assessed under this habitat (Calaciura & Spinelli. 2008). Where scrub occurs outside of this Annex I

[12] *NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill*
[13] *Martin, J.R., O'Neill, F.H. & Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland*
[14] *Priority habitats are indicated using an *.*

grassland habitat, it has been assigned as of local importance (higher value) as, although of high biodiversity value locally, it is common and widespread in the wider area.

4.2.1.12.5 *Arable land (BC1)*

The habitat has been assessed as of Local Importance (lower value) as it is largely associated with highly modified agricultural lands of low biodiversity value.

4.2.1.12.6 *Spoil and bare ground (ED2), Recolonising bare ground (ED3) & Buildings and artificial surfaces (BL3)*

These habitats are common and widespread in the wider area. The habitats have been assessed as of Local Importance (lower value) as they are largely associated with artificial site access tracks and are of low biodiversity value.

4.2.1.12.7 *Hedgerow (WL1) & Stone walls (BL1)*

Hedgerows have been assessed as of local importance (higher value) as they provide connectivity to the wider landscape and provide supporting habitat for a wide variety of faunal species. Stone walls, often occurring in association with hedgerows within the site have been assessed as of local importance (higher value) as they provide connectivity to the wider landscape and provide supporting habitat for a wide variety of faunal species.

4.2.2 Fauna in the Existing Environment

The following subsections provide a breakdown of QI and SCI species recorded during the site visits and assessments.

4.2.2.1.1 *Otter*

No otter signs were recorded within close proximity to the proposed wind turbines, hardstands or access roads, temporary construction compounds, met mast or onsite electrical substation. This is due to the absence of watercourses in relation to these features within the Proposed Development site. Watercourses do occur however at a number of locations along the proposed Grid Connection route. As a result, these watercourses were assessed for signs of otter on both the 24th September 2020, 31st March 2021 and during dedicated aquatic surveys undertaken during September 2021. Otter spraint was recorded during dedicated survey of the Cross River (Grid Reference: 53.4490754 -8.0864511), see Plate 6-21, as well as an additional location to the west of the Proposed Development site during dedicated aquatic surveys (see Figure 4-5). The watercourses were assessed as providing suitable commuting and foraging habitat for the species and it suggests that otter occur within these watercourses downstream of the Grid Connection route, at least on occasion.

Plate 6-21 Example of otter spraint located along the Cross River, downstream of the Grid Connection route.

Otter are a QI species for the River Shannon Callows SAC, which is hydrologically connected to the Cross River which is crossed by the proposed Grid Connection route, and these watercourses were assessed for signs of otter on both the 24th September 2020 and 31st March 2021.

No holts were recorded within 100m watercourse crossings along the proposed Grid Connection route. A single otter spraint was recorded during a dedicated survey of the Cross River (grid reference: 53.4490754 -8.0864511). The watercourses along the Grid Connection route were assessed as providing suitable commuting and foraging habitat for the species and it suggests that otter occur within these watercourses downstream of the Grid Connection route, at least on occasion.

Map Legend

- EIAR Site Boundary
- Otter spraint Locations

N

Drawing Title: **Mammal Records**

Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: PE	Checked By: JH
Project No.: 190907	Figure No.: 4-5
Scale: 1:35000	Date: 2022-06-01

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

4.2.2.2 Birds

The baseline ornithological interest of the Proposed Development site and surrounding area has been fully described in the baseline survey reports. Appendix 5 provide the survey results from the baseline surveys for SCI species for the SPAs considered in this NIS.

A brief summary of the pre-existing survey data is shown in Table 4-3 alongside the current survey data for all species recorded during the 2018-21 surveys. Historical surveys also recorded the additional SCI species northern shoveler (winters 2014/15 and 2016/17), tufted duck (winter 2014/15), little grebe (winter 2014/15) and black-tailed godwit (winter 2014/15). Although it is not always clear from the reports, it appears these species were only recorded outside the survey area used for the 2018-21 surveys (i.e. > 500 m from the Proposed Development, which is the recommended survey area given by the current NatureScot guidelines; SNH, 2017). Therefore, these SCI species are not included in Table 4-3 as there is no pathway via which impacts from the Proposed Development could occur, i.e., the intervening distance is so great that no impacts are likely.

Note that no evidence of any of the species listed in Table 4-3 breeding within the study area was recorded during the 2018-21 surveys.

Table 4-3: Summary of baseline for SCI species recorded during field surveys

SCI species	Baseline
Black-headed gull	Current survey data › Northern Cluster flight activity surveys: combined total[15] of 24 birds (secondary species data), winter 2018/19; 2 birds (secondary species data) breeding season 2019; combined total of 1,956 (max. flock size 500, with the vast majority of sightings at Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location) (secondary species data), winter 2019/20; 13 flights, combined total of 41 (max. flock size 10) (primary target species data) breeding season 2020; combined total of 334 (max. flock size 60) (secondary species data) winter 2020/21; combined total of 51 birds (max. flock size 12) (primary target species data) breeding season 2021. › Southern Cluster flight activity surveys: combined total of 602 (max. flock 150) (secondary species data), winter 2018/19; combined total of 21 (max. of 2 birds) (secondary species data), breeding season 2019; combined total of 339 (max. of 42 birds) (secondary species data), winter 2019-20; 19 flights, combined total of 44 (max. flock size 8), (primary target species data) breeding season 2020; combined total of 312 (max. flock size 60) (secondary species data) winter 2020/21; combined total of 97 birds (max. flock size 8) (primary target species data) breeding season 2021. The vast majority of sightings were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. Pre-existing survey data › Recorded during winter 2014/15 and 2016/18 only.
Common coot	Current survey data › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys (all records as secondary target species): 1 record of 1 bird (breeding season 2020), 1 record of 2 birds (winter 2020/21) and 2 records of a combined total of 6 birds (breeding season 2021). Pre-existing survey data › Recorded during winter 2014/15 only.
Common scoter	Current survey data › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys: 1 record (as secondary target species) of 1 bird (breeding season 2019).

[15] *The combined total numbers of birds refers to the sum of the number of birds recorded each month across each survey season.*

SCI species	Baseline
	Pre-existing survey data › Not recorded in historical surveys.
Eurasian teal	Current survey data › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys (all records as secondary target species): 3 records of a combined total of 36 birds (winter 2018/19), 2 records of a combined total of 7 birds (breeding season 2019) and 3 records of a combined total of 7 birds (winter 2019/20). Pre-existing survey data › Recorded in all years.
Eurasian wigeon	Current survey data › Northern Cluster flight activity surveys: one record (as secondary target species) of flock of 40-50 (winter 2019/20). One record (as primary target species) of flock of 35 (winter 2020/21). › Southern Cluster flight activity surveys: two records (as secondary target species) (winter 2019/20), max. flock size 57. Seven records (as primary target species) with combined total of 291 (max. flock size 120) (winter 2020/21), all of which were observed flying over Feacle Turlough, which is located 730 m from the nearest proposed turbine location. Pre-existing survey data › Recorded in all years.
European golden plover	Current survey data › Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter 2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location.

SCI species	Baseline
	› European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night). Pre-existing survey data › Recorded in all years.
Greenland white-fronted goose	Current survey data › Swan and goose feeding distribution surveys: only recorded in one monthly survey (179 in February 2021 with three separate flocks grazing in fields surrounding Lough Croan, which is located beyond the 1 km survey buffer at 1.5 km distance from the Proposed Development). › Greenland white-fronted goose roost surveys: irregularly recorded at Lough Croan, but with a peak of 267 in January 2021. Birds did not overfly either of the wind farm Clusters, which lie to the south of Lough Croan (i.e. all flights were of birds heading east-west into or away from Lough Croan or north from Lough Croan.) › Northern Cluster flight activity surveys: two flocks in winter 2018/19 (5 & 14); one flock of 72 in winter 2019/20 outside the Proposed Development site leaving Lough Croan heading towards the River Suck Callows; none in winter 2020/21. › Southern Cluster flight activity surveys: none in winter 2018/19; none in winter 2019/20; one flock of 50 in winter 2020/21 recorded outside the Proposed Development site. Pre-existing survey data › Not recorded at the Proposed Development site but recorded in surrounding area (in 2013 and 2016 only, with no identifiable trend in numbers of over the course of the surveys).
Mallard	Current survey data › Northern Cluster flight activity surveys: 2 records (as secondary target species) of a total of 6 birds (winter 2019/20); › Southern Cluster flight activity surveys (all records as secondary target species): 2 records of a combined total of 7 birds (winter 2018/19), 7 records of a combined total of 45 birds (breeding season 2019), 2 records of a combined total of 37 birds (winter 2019/20), 8 records of a combined total of 17 birds (breeding season 2020), 9 records of a total of 22 birds (winter 2021/21) and 22 records of a total of 123 birds (breeding season 2021).

SCI species	Baseline
	Pre-existing survey data › Recorded in winter 2014/15 and 2016/17 only.
Northern lapwing	Current survey data › Northern Cluster flight activity surveys: 11 flights with combined total of 126 (max. flock size of 26) (winter 2018/19); 1 flock of 10 birds (winter 2019/20); 3 flights with combined total of 60 (max. flock size 40) (winter 2020/21). › Southern Cluster flight activity surveys: 6 flights with a combined total of 69 birds (max. flock size 35) (winter 2019/20); 8 flights with a combined total of 313 (max. flock size 50) (winter 2020/21); combined total of 60 birds (max. flock size 34) (primary target species data) breeding season 2021. Most recorded activity focussed around Feacle Lough Turlough, which is located 730 m from the nearest proposed turbine location. Pre-existing survey data › Recorded in all years.
Whooper swan	Current survey data › Swan and goose feeding distribution surveys: max. 189 (March 2021). Two main foraging areas were regularly used: fields near Lough Croan, approximately 1 km north of the Northern Cluster and the Ballyglass River located c. 750 m to the north of the Southern Cluster. › Northern Cluster flight activity surveys: 14 flights with a combined total of 58 (winter 2020/21). Only a single flock of four birds was recorded flying through the Proposed Development site with all others recorded outside the Proposed Development site. › Southern Cluster flight activity surveys: 8 flights with a combined total of 35 (winter 2020/21). None of the birds were recorded flying through the Proposed Development site. Pre-existing survey data › Recorded in all years, mostly in small numbers and often irregularly.

4.3 Hydrology and Hydrogeology

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 3 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:

'With respect to regional hydrology, the proposed Wind Farm site is located primarily within the Upper Shannon (26D) catchment, with a small section to the southeast of the Wind Farm site within the Upper Shannon (26G) catchment, all within Hydrometric Area 26 (Upper Shannon) of the Irish River Basin District.

On a local scale, the proposed Wind Farm site (Northern and Southern Clusters) is broadly contained within the River Suck sub-catchment (Suck_SC_090), with a small section of the Southern Cluster (T19 & T20) contained within the Cross River sub-catchment (Shannon[Upper]_SC_100). The proposed Grid Connection route is mostly located within the Cross River sub-catchment (Shannon[Upper]_SC_100), with a small section close to Athlone located in the Shannon[Upper]_SC_090 sub-catchment. These surface water catchment areas are illustrated in Figure 9-3 (see Appendix 3).

The River Suck is located ~3.5km west of the Southern Cluster area, and ~3.9km west of the Northern Cluster. The River Suck flows south through the village of Ballyforan, west of Dysart, continues south through the town of Ballinasloe before turning southeast and discharging to the River Shannon at Shannonbridge, ~20km south of the Southern Cluster.

The River Suck is within the OPW Suck Drainage District. No Arterial Drainage Schemes occur within the Water Study Area defined on Figure 9-1 (see Appendix 3).

The Cross River is situated ~3.2km east of the nearest Southern Cluster turbines and it drains a catchment that is located east of Lough Croan/Cuilleenirwan Lough and generally south of Lough Fuinshinagh. The headwaters of the Cross River is on the western slope of a small hill (~80m OD) in the townland of Kilcar and is mapped as a series of smaller water features near Dooloughan Lough. The most southeastern turbines of the Southern Cluster area also drain towards this river, possibly via Corkip Lough before the small tributaries of the Cross River emerge from this ephemeral water feature.

Water levels in the River Suck are measured at station 26005 and generally range in elevation between 42.6-45.4 m OD. Water levels in the River Shannon are measured in Athlone at station 26027 and range in elevation between 32.75 m OD to ~36 m OD. Water levels are not measured in the Cross River, however, the Cross River reaches a confluence with the River Shannon ~2km downstream of station 26027. Given this, and the upstream topography data, water levels in the Cross River are likely ~35 m OD near Athlone and perhaps 40-45 m OD upstream, nearer the Southern Cluster of the Wind Farm Site.

The regional area between Roscommon town and just south of Dysart is distinctively void of mapped river channels with the main drainage being provided by the Ballyglass and Cross Rivers. The surface hydrological network does increase towards the margins of this regional area, with channels emerging

1-2km east of the Suck, which then drains to the River Suck.

The orientation of the Cross River suggests that drainage to the west and northwest of this channel (i.e. the Northern and Southern Cluster areas) is hydraulically separated from the hydrology to the east (i.e. Lough Funshinagh. This point is underpinned by water level data presented in Sections 9.3.7.10 and 9.3.7.11 of Appendix 3). This is also supported by the topography, with a series of north-south orientated ridges spanning between the townlands of Eskerbaun northwest to Kilmore.

The Grid Connection route is situated along an existing road and is generally distant from any hydrological features. There are, however, 5 no. watercourse crossings along the Grid Connection route at existing bridges and culverts. The locations of these crossings are provided below in Table 9 7 and are shown in Figure 9-4 (Appendix 3).'

4.3.2 Hydrology in Relation to Screened-in European Sites

4.3.2.1 Non-Hydrologically Dependant European Sites

4.3.2.1.1 *Killeglan Grassland SAC*

The Killeglan Grassland SAC is located ~0.9km southwest of the Southern Cluster of the proposed Wind Farm site. The Killeglan Grassland SAC is designated due to the qualifying interest of Orchid rich calcareous grassland [6210], which is not groundwater dependent. The site is undulating and slopes southwest from a height of ~90m OD to ~55 m OD. The Killeglan Grassland SAC is the only non-water dependent designated site near the Northern and Southern Clusters of the Wind Farm site and the proposed Grid Connection route.

Groundwater flow from the Southern Cluster will drain in the direction of the Killeglan Grassland SAC but will be significantly below ground level at the SAC. There are no surface water channels which could hydraulically connect the Proposed Development site and the Killeglan Grassland SAC. The qualifying interest of the SAC, Orchid rich grassland, are not reliant on surface water or groundwater.

4.3.2.2 Groundwater Dependant European Sites

4.3.2.2.1 *Ballynamona Bog and Corkip Lough SAC*

Corkip Lough is situated ~1km southeast of T20 and ~1.4km southeast of T19. The site investigation data near T19 and T20 indicates that there is >10m of subsoil overburden at these turbine locations, providing a considerable thickness of protection to the underlying groundwater aquifer. The local subsoil (at T19 and T20) is logged as sandy gravelly CLAY, sandy GRAVEL and clayey sandy COBBLES. Maximum groundwater levels near Corkip Lough range between 57.01 – 58.8 m OD in Winter. There is a very shallow valley on the eastern side of Cam Hill which slopes in a south-easterly direction. T19 and T20 are situated just inside the boundaries of this valley. The shallow valley broadly trends in the direction of Corkip Lough, therefore groundwater from near T19/T20 will likely drain towards Corkip Lough. The Ballynamona bog is artificially drained around its perimeter which likely partially isolates it hydraulically from the surround regional groundwater flow systems. These bogs are also normally hydraulically isolated from the surrounding groundwater regime by an impermeable clay/marl layer which underlies the bog. For these reasons, and combined with the considerable thickness of subsoil present below the proposed turbine locations, the bog section of this SAC is not considered further as a potential receptor.

4.3.2.2.2 *Four Roads Turlough*

Groundwater levels at Four Roads Turlough SAC range between 47.8 -48.6 m OD from the historical data, with maximum water level estimated at ~51m OD (GSI GWFlood Data). Groundwater flow from

near turbines T1 and T2 are >76 m OD, with water levels recorded between Four Roads and the Northern Cluster of 61.6-65.5 m OD. There are 2 no. watercourses which emerge between Four Roads turlough and the Northern Cluster and any groundwater which may flow north/northwest from the site is more likely to emerge as baseflow in these, however the possibility of groundwater reaching Four Roads Turlough cannot be discounted.

4.3.2.2.3 *Lough Croan Turlough SPA*

Groundwater flows towards Lough Croan SAC from the Northern Cluster will not occur. The collated groundwater data indicate that the high water level in Lough Croan is higher than that recorded in Gortaphuill turlough (adjacent to T4), and that data, combined with the local topography and other recorded water level data (EPA well at Turrock and well W3) demonstrates that Lough Croan is not hydraulically connected to groundwater flows below the proposed Norther Cluster of the Seven Hills Wind Farm site. Therefore, none of the impact pathways (listed above) can occur at Lough Croan Turlough SAC/SPA/pNHA in respect of the Proposed Development.

4.3.2.2.4 *Four Roads Turlough SPA*

Groundwater levels at Four Roads Turlough SAC range between 47.8 -48.6 m OD from the historical data, with maximum water level estimated at ~51m OD (GSI GWFlood Data). Groundwater flow from near turbines T1 and T2 are >76 m OD, with water levels recorded between Four Roads and the Northern Cluster of 61.6-65.5 m OD. There are 2 no. watercourses which emerge between Four Roads turlough and the Northern Cluster and any groundwater which may flow north/northwest from the site is more likely to emerge as baseflow in these, however the possibility of groundwater reaching Four Roads Turlough cannot be discounted.

4.3.2.3 Surface Water Dependant European Sites

4.3.2.3.1 *River Shannon Callows SAC*

The River Shannon Callows is situated 12km east of the Proposed Development site. The only potential pathway to the River Shannon Callows SAC is through groundwater base flow to a nearby watercourse proximal to the Proposed Development site (Cross, Killeglan, Ballyglass and Suck rivers) which then discharge to the River Shannon. There will be no surface water drainage from the site, all proposed drainage is via recharge and groundwater flowpaths. The Grid Connection route crosses the Cross River which drains to this SAC.

4.3.2.3.2 *River Suck Callows SPA*

The River Suck Callows SPA is mapped 2.4km west of the Proposed Development site. Again, there is no surface water drainage from the site which could impact on surface water quality to the SPA. The site is designated for the presence of bird species as well as for wetlands.

4.3.2.3.3 *Lough Ree SPA*

The Lough Ree SAC is principally fed by the River Shannon, likely with a moderate amount of groundwater inflow around its margins. Water levels in Lough Ree are generally at ~35 m OD. The catchment to Lough Ree (Upper Shannon Catchment) measures ~1,500 km2. The available groundwater data (c.f. Section 9.3.7) does not indicate any potential groundwater flow towards Lough Ree, it is east of Lough Funshinagh which has already been shown to be upgradient of the Northern and Southern Cluster turloughs in Winter. There are no surface waterbodies which drain from the Proposed Development site, and no surface water bodies which are proximal to the Proposed Development site which drain towards Lough Ree.

4.3.2.3.4 *Middle Shannon Callows SPA*

The Middle Shannon Callows SPA is situated 12km of the Proposed Development site. As for the River Shannon Callows SAC, the only potential pathway to the Middle Shannon Callows SPA is through groundwater base flow to a nearby watercourse proximal to the Proposed Development site (Cross, Killeglan, Ballyglass and Suck rivers) which then discharge to the River Shannon. There will be no surface water drainage from the site, all proposed drainage is via recharge and groundwater flowpaths. The Grid Connection route crosses the Cross River which drains to this SPA.

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 Ballynamona Bog and Corkip Lough SAC

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 works, including those along the Grid Connection route, there is no potential for indirect effects to the following terrestrial, rain-fed QI habitat for which this SAC is designated:

- [7150] Depressions on peat substrates of the *Rhynchosporion*
- [91D0] Bog woodland
- [7110] Active raised bogs
- [7120] Degraded raised bogs still capable of natural regeneration

The Proposed Development site is within the same sub-catchment to the SAC. Given the potential for groundwater connectivity between the Proposed Development and the SAC, as identified in the AA Screening Report likely significant effects on the following groundwater dependant habitat (resulting from a deterioration in water quality from release of pollutants during site works via groundwater 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:

- [3180] Turloughs

The SAC is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the above listed QI of the SAC.

5.1.2 Killeglan Grassland SAC

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

There is no potential for direct effects 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.

Given the proximity to the site of the Proposed Development the potential for deterioration of QI habitat resulting from dust contamination during the construction phase has been identified on a precautionary basis. has been identified on a precautionary basis to the terrestrial QI habitat for which the SAC is designated:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]

The SAC is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the above listed QI of the SAC.

5.1.3 Four Roads Turlough SAC

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

There is no potential for direct effects as 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.

The Proposed Development site is within the same sub-catchment as the SAC; given that 2 no. watercourses which emerge between Four Roads turlough and the Northern Cluster of the Proposed Development (see Section 9.4.2.9, Chapter 9 'Water and Hydrology of the EIAR) the potential for significant effects on groundwater dependant turlough habitat resulting from a deterioration in water quality from release of pollutants during site works via groundwater pathways has been identified on a precautionary basis:

- [3180] Turloughs

It should be noted that there are no mapped turloughs, or designated turlough sites downstream or in close proximity to the proposed Grid Connection route. Therefore, proposed works along the Grid Connection route will not impact on turloughs or designated turlough sites.

The SAC is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the above listed QI of the SAC.

5.1.4 River Shannon Callows SAC

The individual pathways for effect that were identified in Table 3-1 of the AA Screening Report (Appendix 1) and the QIs with the potential to be affected are described below.

There is no potential for direct effects as the Proposed Development is located entirely outside of this designated site.

Due to the terrestrial nature of the QI habitat and the intervening distance between the SAC and the Proposed Development site, there is no potential for indirect effects on the following QIs:

- [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 Grid Connection route crosses the Cross River, which in turn flows into the SAC, and therefore potential for indirect effects exists in the form of a deterioration in water quality on the following QIs:

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

Taking a precautionary approach, due to works to be carried out along the Grid Connection route which crosses watercourses connected to the SAC the potential for direct and indirect disturbance/ displacement of Otter also requires further consideration.

The SAC is considered to be within the Likely Zone of Impact and further assessment is required with regard to the above listed QIs of the SAC.

5.1.5 Lough Croan Turlough SPA

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 following SCI species was not recorded during surveys and so cannot be significantly affected by disturbance/displacement or collision mortality/barrier effects:

- [A056] Northern Shoveler *Anas clypeata*

The following SCI species were recorded during surveys:

- [A140] European Golden Plover Pluvialis apricaria
- [A395] Greenland White-fronted Goose Anser albifrons flavirostris

The core foraging distances for wintering European golden plover and Greenland white-fronted goose are up to 12 km (Gillings *et al.*, 2007) and 8 km (SNH, 2016), respectively. As these distances are both greater than the distance between the Proposed Development and the SPA, there is therefore potential ecological connectivity between the two.

Taking a precautionary approach, which assumes that the birds recorded during the surveys could represent SPA birds, the potential for disturbance/displacement to these two SCI species during the construction, operational and decommissioning phases, as well as barrier effects and collision mortality during the operational phase, cannot be ruled out at the screening stage and requires further consideration.

The Proposed Development site is within the same sub-catchment to the SPA; however detailed hydrological assessments carried out at the site (see Section 4.3 and see also Section 9.4.2.9, of the detailed hydrological assessment provided as Appendix 3 of this NIS) have concluded that Lough Croan SPA is not hydrologically connected to groundwater flows below the site of the Proposed Development. Therefore, no potential exists for significant effects via a reduction in water quality, reduction in volume or change in flow path as a result of the Proposed Development on the following SCI:

- [A999] Wetland and Waterbirds habitat

This site is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the following SCI species in relation to construction, operational and decommissioning phase disturbance/displacement effects and operational collision mortality and barrier effects:

- European golden plover (wintering)
- Greenland white-fronted goose (wintering)

No further assessment is required for the following SCI species and habitats due to a lack of ecological and hydrogeological connectivity between the SPA and Proposed Development:

- Northern shoveler (wintering/breeding)
- Wetland and waterbirds

5.1.6 River Suck Callows SPA

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 following SCI species were recorded during surveys:

- [A038] Whooper Swan *Cygnus cygnus*
- [A050] Eurasian Wigeon *Mareca penelope*
- [A140] European Golden Plover
- [A142] Northern Lapwing *Vanellus vanellus*
- [A395] Greenland White-fronted Goose

The core foraging distances for wintering whooper swan, Eurasian wigeon, European golden plover, northern lapwing and Greenland white-fronted goose are up to 5 km (SNH, 2016), 20 km[16] (SNH, 2016) 12 km (Gillings *et al.*, 2007), 12 km (Gillings *et al.*, 2007) and 8 km (SNH, 2016), respectively. As these distances are greater than the distance between the Proposed Development and the SPA, there is therefore potential ecological connectivity between the two.

Taking a precautionary approach, which assumes that the birds recorded during the surveys could represent SPA birds, the potential for disturbance/displacement to these five SCI species during the construction, operational and decommissioning phases, as well as collision mortality and barrier effects during the operational phase, cannot be ruled out at the screening stage and requires further consideration.

The Proposed Development site is within the same sub-catchment to the SPA and potential hydrological connectivity has been identified between the Proposed Development site and the supporting wetland habitat of the SPA given that the proposed Grid Connection route crosses the Ballyglass River, which in turn flows to the SPA. Therefore, potential exists for significant effects via a reduction in water quality, reduction in volume or change in flow path as a result of the Proposed Development on the following SCI:

- [A999] Wetland and Waterbirds habitat

[16] *Note that where no core foraging distances are available, a maximum distance of 20 km has been assumed as a precaution in line with the largest foraging range quoted for any species by SNH (2016) guidance. This applies here to wintering Eurasian wigeon.*

This site is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the following SCI species in relation to construction, operational and decommissioning phase disturbance/displacement effects and operational collision mortality and barrier effects:

- **Whooper swan (wintering)**
- **Eurasian wigeon (wintering)**
- **European golden plover (wintering)**
- **Northern lapwing (wintering)**
- **Greenland white-fronted goose (wintering)**

Further assessment is also required for the following SCI habitat in relation to effects on water quality, reduction in volume or change in flow path:

- **Wetland and waterbirds**

5.1.7 Four Roads Turlough SPA

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 following SCI species were recorded during surveys:

- [A140] European Golden Plover
- [A395] Greenland White-fronted Goose

The core foraging distances for wintering European golden plover and Greenland white-fronted goose are up to 12 km (Gillings *et al.*, 2007) and 8 km (SNH, 2016), respectively. As these distances are both greater than the distance between the Proposed Development and the SPA, there is therefore potential ecological connectivity between the two.

Taking a precautionary approach, which assumes that the birds recorded during the surveys could represent SPA birds, the potential for disturbance/displacement to these two SCI species during the construction, operational and decommissioning phases, as well as collision mortality and barrier effects during the operational phase, cannot be ruled out at the screening stage and requires further consideration.

The Proposed Development site is within the same sub-catchment to the SPA; potential hydrological connectivity has been identified between the Proposed Development site and the groundwater dependant supporting habitat of the SPA on a precautionary basis, and therefore deterioration of water quality via release of pollutants, reduction in volume or change in flow path affecting the following SCI cannot be discounted:

- [A999] Wetlands and Waterbirds [A999]

This site is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the following SCI species in relation to construction, operational and decommissioning phase disturbance/displacement effects and operational collision mortality and barrier effects:

- **European golden plover (wintering)**
- **Greenland white-fronted goose (wintering)**

Further assessment is also required for the following SCI habitat in relation to effects on water quality, reduction in volume or change in flow path:

- **Wetland and waterbirds**

5.1.8 Lough Ree SPA

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 following SCI species were not recorded during surveys and so cannot be significantly affected by disturbance/displacement or collision mortality/barrier effects:

- [A004] Little Grebe Tachybaptus ruficollis
- [A056] Northern Shoveler
- [A061] Tufted Duck Aythya fuligala
- [A067] Goldeneye Bucephala clangula
- [A193] Common Tern Sterna hirundo

The following SCI species were recorded during surveys:

- [A038] Whooper Swan
- [A050] Eurasian Wigeon
- [A052] Eurasian Teal *Anas crecca*
- [A053] Mallard *Anas platyrhynchos*
- [A065] Common Scoter *Melanitta nigra*
- [A125] Eurasian Coot *Fulica atra*
- [A140] European Golden Plover
- [A142] Northern Lapwing

The core foraging distances[17] for wintering whooper swan, Eurasian wigeon, Eurasian teal, mallard, Eurasian coot, European golden plover and Northern lapwing are up to 5 km (SNH, 2016), 20 km (SNH, 2016), 20 km (SNH, 2016), 20 km (SNH, 2016), 20 km (SNH, 2016), 12 km (Gillings *et al.*, 2007) and 12 km (Gillings *et al.*, 2007), respectively. The core foraging distance for breeding common scoter is 20 km (SNH, 2016). As these distances are all greater than the distance between the Proposed Development and the SPA (for all but whooper swan), there is therefore potential ecological connectivity between the two for all species except whooper swan. As the Proposed Development is beyond the core foraging range for whooper swan, any whooper swans forming part of the Lough Ree population cannot be significantly affected by disturbance/displacement or collision mortality/barrier effects.

Taking a precautionary approach, which assumes that the birds recorded during the surveys could represent SPA birds, the potential for disturbance/displacement to the other seven SCI species listed above during the construction, operational and decommissioning phases, as well as collision mortality and barrier effects during the operational phase, cannot be ruled out at the screening stage and requires further consideration.

The Proposed Development is located within a separate sub-catchment to the SPA; no potential hydrological connectivity exists between the Proposed Development site and the SPA, as all water flow is to the south. Therefore, no potential exists for significant effects via a reduction in water quality,

[17] *Note that where no core foraging distances are available, a maximum distance of 20 km has been assumed as a precaution in line with the largest foraging range quoted for any species by SNH (2016) guidance. This applies here to Eurasian wigeon, Eurasian teal, mallard, Eurasian coot and common scoter.*

reduction in volume or change in flow path as a result of the Proposed Development on the following SCI:

- [A999] Wetland and Waterbirds habitat

This site is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the following SCI species in relation to construction, operational and decommissioning phase disturbance/displacement effects and operational collision mortality and barrier effects:

- **Eurasian wigeon (wintering)**
- **Eurasian teal (wintering)**
- **Mallard (wintering)**
- **Common scoter (breeding)**
- **Eurasian coot (wintering)**
- **European golden plover (wintering)**
- **Northern lapwing (wintering)**

No further assessment is required for the following SCI species and habitat due to a lack of ecological and hydrogeological connectivity between the SPA and Proposed Development:

- **Little grebe (wintering)**
- **Whooper swan (wintering)**
- **Northern shoveler (wintering)**
- **Tufted duck (breeding)**
- **Goldeneye (wintering)**
- **Common tern (breeding)**
- **Wetland and waterbirds**

5.1.9 Middle Shannon Callows SPA

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 following SCI species were not recorded during surveys and so cannot be significantly affected by disturbance/displacement or collision mortality/barrier effects:

- [A122] Corncrake *Crex crex*
- [A156] Black-tailed godwit *Limosa limosa*

The following SCI species were recorded during surveys:

- [A038] Whooper Swan
- [A050] Eurasian Wigeon
- [A140] European Golden Plover
- [A142] Northern Lapwing
- [A179] Black-headed gull *Chroicocephalus ridibundus*

The core foraging distances[18] for wintering whooper swan, Eurasian wigeon, European golden plover, Northern lapwing and black-headed gull are up to 5 km (SNH, 2016), 20 km (SNH, 2016), 12 km (Gillings *et al.*, 2007), 12 km (Gillings *et al.*, 2007) and 20 km (SNH, 2016), respectively. As these distances are greater than the distance between the Proposed Development and the SPA (for all species but whooper swan), there is therefore potential ecological connectivity between the two for all species except whooper swan. As the Proposed Development is beyond the core foraging range for whooper swan, any whooper swans forming part of the Middle Shannon Callows population cannot be significantly affected by disturbance/displacement or collision mortality/barrier effects.

Taking a precautionary approach, which assumes that the birds recorded during the surveys could represent SPA birds, the potential for disturbance/displacement to the other four SCI species during the construction, operational and decommissioning phases, as well as collision mortality and barrier effects during the operational phase, cannot be ruled out at the screening stage and requires further consideration.

The proposed Grid Connection route crosses the Ballyglass and Cross River, which in turn have connectivity to the SPA, and therefore, potential exists for significant effects via a reduction in water quality, reduction in volume or change in flow path as a result of the Proposed Development on the following SCI:

- [A999] Wetland and Waterbirds habitat

This site is considered to be *within* the Likely Zone of Impact and further assessment is required with regard to the following SCI species in relation to construction, operational and decommissioning phase disturbance/displacement effects and operational collision mortality and barrier effects:

- **Eurasian wigeon (wintering)**
- **European golden plover (wintering)**
- **Northern lapwing (wintering/breeding)**
- **Black-headed gull (wintering)**

Further assessment is also required for the following SCI habitat in relation to effects on water quality, reduction in volume or change in flow path:

- **Wetland and waterbirds**

No further assessment is required for the following SCI species as there is no ecological connectivity between the SPA and the Proposed Development:

- **Whooper swan (wintering)**
- **Corncrake (breeding)**
- **Black-tailed godwit (wintering/breeding)**

[18] Note that where no core foraging distances are available, a maximum distance of 20 km has been assumed as a precaution in line with the largest foraging range quoted for any species by SNH (2016) guidance. This applies here to wintering Eurasian wigeon and black-headed gull.

5.1.10 Summary of QIs/SCIs and Requirements for Further Assessment

Table 5-1 below provides a summary the QIs/ SCIs for the screened-in European Sites and whether or not further assessment, due to a pathway for effect having been identified, is required.

Table 5-1: Summary of QIs/SCIS and requirements for further assessment

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Special Areas of Conservation (SAC)				
Ballynamona Bog And Corkip Lough SAC	› [3180] Turloughs* › [7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration › [7150] Depressions on peat substrates of the *Rhynchosporion* › [91D0] Bog woodland	Detailed conservation objectives for this site, (Version 1, September 2016[19]), were reviewed as part of the assessment and are available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO0EuropeanSite02339.pdf	› [7150] Depressions on peat substrates of the *Rhynchosporion* › [91D0] Bog woodland › 7110] Active raised bogs › [7120] Degraded raised bogs still capable of natural regeneration	**No**
			› [3180] Turloughs	**Yes**

[19] *NPWS (2016) Conservation Objectives: Ballynamona Bog and Corkip Lough SAC 002339. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Killeglan Grassland SAC	› Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	Detailed conservation objectives for this site (Version 1, June 2018[20]), were reviewed as part of the assessment and are available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002214.pdf	› Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	**Yes**
Four Roads Turlough SAC	› [3180] Turloughs*	Detailed conservation objectives for this site (Version 1, February 2018[21]), were reviewed as part of the assessment and are available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001637.pdf	› [3180] Turloughs*	**Yes**

[20] *NPWS (2018) Conservation Objectives: Killeglan Grassland SAC 002214. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*
[21] *NPWS (2018) Conservation Objectives: Four Roads Turlough SAC 001637. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
River Shannon Callows SAC	**Habitats** › [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) › [6510] Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) › [7230] Alkaline fens › [8240] Limestone pavements* › [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* **Species** › [1355] Otter (*Lutra lutra*)	This SAC has the generic conservation objective (NPWS, 23/03/21[22]): "*To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected*" Available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000216.pdf	› [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) › [6510] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) › [8240] Limestone pavements*	**No**
			› [7230] Alkaline fens › [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* › [1355] Otter (*Lutra lutra*)	**Yes**

[22] *NPWS (2021) Conservation objectives for River Shannon Callows SAC [000216]. Generic Version 8.0. Department of Housing, Local Government and Heritage.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Special Protection Areas (SPA)				
Lough Croan Turlough SPA	› [A056] Northern Shoveler *Anas clypeata* (w/b) › [A140] European Golden Plover *Pluvialis apricaria* (w) › [A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (w) › [A999] Wetland and Waterbirds	This SPA has the generic conservation objectives (NPWS, 23/03/21)[23]: "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* And "*To maintain or restore the favourable conservation condition of the wetland habitat at Lough Croan Turlough SPA as a resource for the regularly-occurring migratory waterbirds that utilise it."* Available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004139.pdf	› [A056] Northern Shoveler *Anas clypeata* › [A999] Wetland and Waterbirds	**No**
			› [A140] European Golden Plover *Pluvialis apricaria* (w) › [A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (w)	**Yes**

[23] *NPWS (2021) Conservation objectives for Lough Croan Turlough SPA [004139]. Generic Version 8.0. Department of Housing, Local Government and Heritage.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
River Suck Callows SPA	› [A038] Whooper Swan *Cygnus cygnus* (w) › [A050] Eurasian Wigeon *Mareca penelope* (w) › [A140] European Golden Plover *Pluvialis apricaria* (w) › [A142] Northern Lapwing *Vanellus vanellus* (w) › [A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (w) › [A999] Wetland and Waterbirds	This site has the generic conservation objectives (NPWS, 23/03/21[24]): "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* And: *To maintain or restore the favourable conservation condition of the wetland habitat at River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it"* *Available at:* www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004097.pdf	› [A038] Whooper Swan *Cygnus cygnus* (w) › [A050] Eurasian Wigeon *Mareca penelope* (w) › [A140] European Golden Plover *Pluvialis apricaria* (w) › [A142] Northern Lapwing *Vanellus vanellus* (w) › [A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (w) › [A999] Wetland and Waterbirds	**Yes**

[24] *NPWS (2021) Conservation objectives for River Suck Callows SPA [004097]. Generic Version 8.0. Department of Housing, Local Government and Heritage.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Four Roads Turlough SPA	› [A140] European Golden Plover *Pluvialis apricaria* (w) › [A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (w) › [A999] Wetland and Waterbirds	This site has the generic conservation objectives (NPWS, 23/03/21): "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* And: *"To maintain or restore the favourable conservation condition of the wetland habitat at Four Roads Turlough SPA as a resource for the regularly occurring migratory waterbirds that utilise it."* Available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004140.pdf	› [A140] European Golden Plover *Pluvialis apricaria* (w) › [A395] Greenland White-fronted Goose (*Anser albifrons flavirostris*) › [A999] Wetland and Waterbirds]	**Yes**

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Lough Ree SPA	› [A004] Little Grebe *Tachybaptus ruficollis* (w) › [A038] Whooper Swan *Cygnus cygnus* (w) › [A050] Eurasian Wigeon *Mareca penelope* (w) › [A052] Eurasian Teal *Anas crecca* (w) › [A053] Mallard *Anas platyrhynchos* (w) › [A056] Northern Shoveler *Anas clypeata* (w) › [A061] Tufted Duck *Aythya fuligula* (b)	This site has the generic conservation objectives (NPWS, 23/03/21[25]): "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* And: "*To maintain or restore the favourable conservation condition of the wetland habitat at Lough Ree SPA as a resource for the*	› [A004] Little Grebe *Tachybaptus ruficollis* › [A056] Northern Shoveler *Anas clypeata* › [A061] Tufted Duck *Aythya fuligala* › [A067] Goldeneye *Bucephala clangula* › [A193] Common Tern *Sterna hirundo*	**No**

[25] *NPWS (2021) Conservation objectives for Lough Ree SPA [004064]. Generic Version 8.0. Department of Housing, Local Government and Heritage.*

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
	› [A065] Common Scoter *Melanitta nigra* (b) › [A067] Goldeneye *Bucephala clangula* (w) › [A125] Eurasian Coot *Fulica atra* (w) › [A140] European Golden Plover *Pluvialis apricaria* (w) › [A142] Northern Lapwing *Vanellus vanellus* (w) › [A193] Common Tern *Sterna hirundo* (b) › [A999] Wetland and Waterbirds	*regularly-occurring migratory waterbirds that utilise it.*" Available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004064.pdf	› [A038] Whooper Swan *Cygnus cygnus* › [A050] Eurasian Wigeon *Mareca penelope* › [A052] Eurasian Teal *Anas crecca* › [A053] Mallard *Anas platyrhynchos* › [A065] Common Scoter *Melanitta nigra* › [A125] Eurasian Coot *Fulica atra* › [A140] European Golden Plover *Pluvialis apricaria* › [A142] Northern Lapwing *Vanellus vanellus* › [A999] Wetland and Waterbirds	**Yes**

European Site	Qualifying Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 10/07/2021	Conservation Objectives	Further Consideration of QIs/SCIs Required?	
			QI / SCI	Requirement for further Assessment?
Middle Shannon Callows SPA	› [A038] Whooper Swan *Cygnus cygnus* (w) › [A050] Eurasian Wigeon *Maracas penelope* (w) › [A122] Corncrake *Crex crex* (b) › [A140] European Golden Plover *Pluvialis apricaria* (w) › [A142] Northern Lapwing *Vanellus vanellus* (w/b) › [A156] Black-tailed godwit *Limosa limosa* (w/b) › [A179] Black-headed Gull *Chroicocephalus ridibundus* (w) › [A999] Wetland and Waterbirds	This site has the generic conservation objectives (NPWS, 23/03/21[26]): "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* And: "*To maintain or restore the favourable conservation condition of the wetland habitat at Middle Shannon Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.*" Available at: www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004096.pdf	› [A122] Corncrake *Crex crex* › [A156] Black-tailed godwit *Limosa limosa*	**No**
			› [A038] Whooper Swan *Cygnus cygnus* › [A050] Eurasian Wigeon *Mareca penelope* › [A140] European Golden Plover *Pluvialis apricaria* › [A142] Northern Lapwing *Vanellus vanellus* › [A179] Black-headed gull *Chroicocephalus ridibundus* › [A999] Wetland and Waterbirds	**Yes**

[26] *NPWS (2021) Conservation objectives for Middle Shannon Callows SPA [004096]. Generic Version 8.0. Department of Housing, Local Government and Heritage.*

5.2 Desk Study – European Sites

5.2.1 Desk Study methodology

The desk study undertaken for this assessment included a thorough review of the available ecological data associated with the study area 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 (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[27,28].

5.2.2 Desk Study Results

5.2.2.1 Ballynamona Bog and Corkip Lough SAC [002339]

The Conservation Objectives document and Natura 2000 Data Form for this site as available on the NPWS website were reviewed during this assessment. Information in relation to the conservation objectives of the QI's and site-specific pressures and threats for the SAC is detailed below.

5.2.2.1.1 *Review of conservation objectives*

The relevant QIs, as brought forward in Section 5.1.1 and the associated conservation objectives are presented in Table 5-2. The Targets and Attributes for the relevant habitats and species, as described in the Ballynamona Bog and Corkip Lough SAC Conservation Objectives documents (NPWS, Version 1, September 2016[29]), were reviewed and considered in this assessment.

Table 5-2: Screened in Qualifying Interest and Conservation Objectives for Ballynamona Bog and Corkip Lough SAC

Qualifying Interest	Conservation Objective
Turloughs	To restore the favourable conservation condition of Turloughs in Ballynamona Bog and Corkip Lough SAC

5.2.2.1.2 *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 5-3.

[27] *Status of Habitats and Species - Article 17 Reports, Online, Available at: https://www.npws.ie/publications/article-17-reports Accessed 19.09.2020*
[28] *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*
[29] *NPWS (2016) Conservation Objectives: Ballynamona Bog and Corkip Lough SAC 002339. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.*

Table 5-3: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Low	I01	Invasive non-native species	Both
Medium	E03.01	Disposal of household / recreational facility waste	Both
Low	J02.01	Landfill, land reclamation and drying out, general	Outside
Medium	J02.05	Modification of hydrographic functioning, general	Outside

Potential pathways for effect with regard to site-specific threats, pressures and activities have been identified in relation to potential for modification of the local hydrological regime i.e. 'Modification of hydrographic functioning, general', 'drying out'; the potential for impacts is assessed further in Section 6.

5.2.2.1.3 *Qualifying Interests (as brought forward from Section 5.1.1)*

Turloughs

According to the site-specific conservation objectives (NPWS, 2016) the full extent of flooding and wetland vegetation within Corkip Lough turlough is currently unknown but has been previously estimated as being between approx. 60 and 77 ha. Maximum water levels have been derived from the high-water mark on aerial photography of the turlough area, which is at ~57 m OD. The location of the turlough is shown in Map 2 of the Conservation Objectives document; this is located within the western area of the SAC. From a highly precautionary perspective this habitat has been identified as occurring within the likely Zone of Impact.

5.2.2.2 Killeglan Grassland SAC [002214]

The Conservation Objectives document and Natura 2000 Data Form for this site as available on the NPWS website were reviewed during this assessment. Information in relation to the conservation objectives of the QI's and site-specific pressures and threats for the SAC is detailed below.

5.2.2.2.1 *Review of Conservation Objectives*

The relevant QIs, as brought forward in Section 3.1.3 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 Four Roads Turlough SAC Conservation Objectives documents (NPWS, Version 1, June 2018[30]), were reviewed and considered in this assessment.

Table 5-4: Qualifying Interest and Conservation Objectives (Version 1, 2018)

Qualifying Interest	Conservation Objective
Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	To restore the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) in Killeglan Grassland SAC.

[30] *NPWS (2018) Conservation Objectives: Killeglan Grassland SAC 002214. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*

5.2.2.2.2 *Review of site-specific pressures and threats*

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

Table 5-5: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
High	J02.01	Landfill, land reclamation and drying out, general	Inside
High	A04.01.02	Intensive sheep grazing	Inside

The Proposed Development will not result in any will not affect any change in the site specific threats, pressures and activities listed above; there will be no land take within the SAC and sheep grazing is an agricultural activity unrelated to and independent from the Proposed Development. Therefore, no pathways for impact with regard to any site-specific threats, pressures and activities were identified.

5.2.2.2.3 *Qualifying Interests (as brought forward from Section 5.1.2)*

Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]

According to the site-specific conservation objectives (NPWS, 2018) the total current area of semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) in Killeglan Grassland SAC is unknown. As part of the Grasslands Monitoring Project 2006, the habitat was surveyed by Dwyer et al. (2007) who stated that the habitat is well-distributed throughout the SAC and occurs in association with patches of scrub, shattered limestone pavement and outcropping limestone boulders, with the best example of the habitat occurring in the central area of the SAC on relatively flat shallow soils. More scattered occurrences are located in a mosaic with scrub along the western and northern boundaries (Dwyer et al., 2007). It is assumed for the purposes of this NIS that the habitat occurs throughout the SAC within its boundaries. From a precautionary perspective, given the proximity of the SAC to the site of the Proposed Development, this habitat has been identified as occurring within the likely Zone of Impact.

5.2.2.3 Four Roads Turlough SAC [001637]

The Conservation Objectives document and Natura 2000 Data Form for this site as available on the NPWS website were reviewed during this assessment. Information in relation to the conservation objectives of the QI's and site-specific pressures and threats for the SAC is detailed below.

5.2.2.3.1 *Review of Conservation Objectives*

The relevant QIs, as brought forward in Section 5.1.3 and the associated conservation objectives are presented in Table 5-6 below. The Targets and Attributes for the relevant habitats and species, as

described in the Four Roads Turlough SAC Conservation Objectives documents (NPWS, Version 1, October 2018[31]), were reviewed and considered in this assessment.

Table 5-6: Qualifying Interest and Conservation Objectives (Version 1, 2018)

Qualifying Interest	Conservation Objective
Turloughs	To restore the favourable conservation condition of Turloughs in Four Roads Turlough SAC.

5.2.2.3.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-7.

Table 5-7: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Low	A05.02	Stock feeding	Both

The Proposed Development will not result in any in stock feeding within or in proximity to the SAC as this is an agricultural activity unrelated to and independent from the Proposed Development. Therefore, no pathways for impact with regard to any site-specific threats, pressures and activities were identified.

5.2.2.3.3 Qualifying Interests (as brought forward from Section 5.1.3)

Turloughs

According to the site-specific conservation objectives (NPWS, 2021) the approximate area of Four Roads (or Cloonloughlin) turlough in Four Roads Turlough SAC is 72.1ha, based on Goodwillie (1992). It was described as having a relatively flat basin which is subject to less frequent flooding than the nearby Lisduff turlough. Map 3 of the Conservation Objectives document shows the extent of the turlough habitat. From a precautionary perspective this habitat has been identified as occurring within the likely Zone of Impact.

5.2.2.4 River Shannon Callows SAC [000216]

The Conservation Objectives document and Natura 2000 Data Form for this site as available on the NPWS website were reviewed during this assessment. Information in relation to the conservation objectives of the QI's and site-specific pressures and threats for the SAC is detailed below.

5.2.2.4.1 Review of Conservation Objectives

The relevant QIs, as screened in within Section 5.1.4 and the associated conservation objectives are presented in Table 5-8 below. The Targets and Attributes for the relevant habitats and species, as

[31] *NPWS (2018) Conservation Objectives: Four Roads Turlough SAC 001637. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*

described in the River Shannon Callows SAC Conservation Objectives documents (NPWS, Version 1, January 2022[32]), were reviewed and considered in this assessment.

Table 5-8: Qualifying Interest and Conservation Objectives (Version 1 2022)

Qualifying Interest	Conservation Objective
Alkaline fens	To maintain the favourable conservation condition of Alkaline fens in River Shannon Callows SAC.
Alluvial forests with *Alnus glutinosa* 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
Otter (*Lutra lutra*)	To maintain the favourable conservation condition of Otter (*Lutra lutra*) in River Shannon Callows SAC

5.2.2.4.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-9.

Table 5-9: Site-specific threats, pressures and activities for River Shannon Callows SAC

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Low	G01	Outdoor sports and leisure activities, recreational activities	Inside
Medium	J02.11	Siltation rate changes, dumping, depositing of dredged deposits	Inside
Medium	J02.05.02	Modifying structures of inland water courses	Inside
Low	F03.01	Hunting	Both
Medium	A04.01	Intensive grazing	Inside
Low	C01.03.02	Mechanical removal of peat	Inside
Low	J02.01	Landfill, land reclamation and drying out, general	Inside
High	A03.03	Abandonment / lack of mowing	Inside
Low	G05.01	Trampling, overuse	Inside
Medium	B02.02	Forestry clearance	Inside

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

Low	D01.01	Paths, tracks, cycling tracks	Inside
Medium	K03.04	Predation	Both
High	A04.03	Abandonment of pastoral systems, lack of grazing	Inside
High	A07	Use of biocides, hormones and chemicals	Inside
Low	A04.02.05	Non intensive mixed animal grazing	Inside
Low	A10.01	Removal of hedges and copses or scrub	Inside
Low	J02.05	Modification of hydrographic functioning, general	Inside
High	J02.04.01	Flooding	Inside
Medium	A08	Fertilisation	Inside
Low	B06	Grazing in forests/ woodland	Inside

Grazing, peat removal, forestry and fertilisation, use of agricultural chemicals and other land management practices within the SAC are all activities unrelated to and independent from the Proposed Development. All leisure activities are also unrelated to and independent from the Proposed Development. The Proposed Development will not affect urbanisation, the modification of structures of inland water courses or paths/tracks/cycling tracks, as they are under the control of the local planning authority.

The detailed flood risk assessment carried out for the Proposed Development (see Appendix 3 of this NIS) concluded that "the Proposed Development will not increase the flood risk elsewhere in the wider area". Therefore, it is not anticipated that the Proposed Development would result in any increase in this identified threat/pressure on the SAC.

Potential pathways for impact with regard to site-specific threats, pressures and activities have been identified in relation to potential for modification of the local hydrological regime i.e. 'Modification of hydrographic functioning, general', 'drying out' and deterioration in water quality that could potentially result in 'siltation rate changes'; the potential for impacts is assessed further in Section 6.

5.2.2.4.3 *Qualifying Interests (as brought forward from Section 5.1.4)*

Alkaline Fens

A large area of this habitat is known to occur on an area of low-lying terrestrial land west of the river immediately south of Portumna Bridge and south east of the town of Portumna.

Alluvial forest with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)**

Alluvial forest occurs on a series of alluvial islands just below the ESB weir near Meelick. Several of the islands are dominated by well-grown woodland consisting mainly of Ash (*Fraxinus excelsior*) and Willow (*Salix* spp.). These islands are prone to regular flooding from the river.

5.2.2.5 Lough Croan Turlough SPA [004139]

The Conservation Objectives document and Natura 2000 Data Form for this site, as available on the NPWS website, were reviewed during this assessment (see Appendix 9). Information in relation to the conservation objectives of the SCIs and site-specific pressures and threats for the SPA is detailed below.

As identified in Section 5.1 and summarised in Table 5-1, the following SCI species were screened in because they were recorded during surveys (with likely ecological connectivity between the SPA and Proposed Development) and could be negatively affected by disturbance/displacement (construction, operational and decommissioning phases) and/or collision mortality/barrier effects (operational phase):

- European golden plover
- Greenland white-fronted goose

As identified in Section 5.1 and summarised in Table 5-1, the following SCIs were screened out due to a lack of ecological and/or hydrogeological connectivity and so are not discussed further in this section:

- Northern shoveler
- Wetland and waterbirds habitat

5.2.2.5.1 *Review of Conservation Objectives*

The relevant SCIs (i.e. those SCIs screened in for further assessment) and the associated generic conservation objectives are presented in Table 5-10. These have been taken from the NPWS (Version 9.0, 2022) Conservation Objectives for Lough Croan Turlough SPA. This document has been reviewed in the preparation of this NIS and additional species/habitat specific information is also provided in the subsequent paragraphs and sections.

No specific attributes or targets for the SCIs are provided in the Generic Conservation Objectives document. However, supplementary information has been taken from the Irish Wetland Bird Survey (I-WeBS) scheme and other relevant sources, which provide the best-available and most-recent baseline population estimates for each SCI species of the named SPA. These estimates form the basis for further assessment.

Table 5-10: Qualifying Interest and Generic Conservation Objectives (Version 9.0, 2022[33])

Special Conservation Interest (SCI)	Conservation Objective
European golden plover	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
Greenland white-fronted goose	

5.2.2.5.2 *Review of site-specific pressures and threats*

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

[33] *NPWS (2022) Conservation objectives for Lough Croan Turlough SPA [004139]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

Table 5-11: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Medium	A08	Fertilisation	Inside
Low	A04	Grazing	Inside
Medium	A08	Fertilisation	Outside

The Proposed Development will not affect any of the site-specific threats, pressures and activities listed above, as fertilisation and grazing are agricultural activities unrelated to and independent from the Proposed Development.

5.2.2.5.3 *Special Conservation Interests (as brought forward from Section 5.1.5)*

The following information has been extracted from the NPWS Natura 2000 Data Form (NPWS, 2018) and I-WeBS results for the Southern Roscommon Lakes (which encompass Lough Croan Turlough SPA) for the relevant species:

European golden plover

- Reference population at designation (2010): 2,025
- Mean population 2008/09 – 2017/18: 3,625 (I-WeBS)

Greenland white-fronted goose

- Reference population at designation (2010): 164
- Mean population 2008/09 – 2017/18: 41 (I-WeBS)

5.2.2.6 River Suck Callows SPA [004097]

The Conservation Objectives document and Natura 2000 Data Form for this site, as available on the NPWS website, were reviewed during this assessment. Information in relation to the conservation objectives of the SCIs and site-specific pressures and threats for the SPA is detailed below.

As identified in Section 5.1 and summarised in Table 5-1, the following SCI species were screened in because they were recorded during surveys (with likely ecological connectivity between the SPA and Proposed Development) and could be negatively affected by disturbance/displacement (construction, operational and decommissioning phases) and/or collision mortality/barrier effects (operational phase):

- Whooper swan
- Eurasian wigeon
- European golden plover
- Northern lapwing
- Greenland white-fronted goose

The Proposed Development is located entirely outside the designated site, so there will be no direct effects from habitat loss or damage. As identified in Section 5.1 and summarised in Table 5-1, the following SCI was screened in owing to hydrological connectivity between the Proposed Development and the SPA, with the potential for negative indirect effects via a reduction in water quality, reduction in volume or change in flow path:

- Wetland and Waterbirds habitat

5.2.2.6.1 Review of Conservation Objectives

The relevant SCIs (i.e. those SCIs screened in for further assessment) and the associated generic conservation objectives are presented in Table 5-12. These have been taken from the NPWS (Version 9.0, 2022) Conservation Objectives for River Suck Callows SPA. This document has been reviewed in the preparation of this NIS and additional species/habitat specific information is also provided in the subsequent paragraphs and sections.

No specific attributes or targets for the SCIs are provided in the Generic Conservation Objectives document. However, supplementary information has been taken from the Irish Wetland Bird Survey (I-WeBS) scheme and other relevant sources, which provide the best-available and most-recent baseline population estimates for each SCI species of the named SPA. These estimates form the basis for further assessment.

Table 5-12: Special Conservation Interests and Conservation Objectives (Version 9.0, 2022[34])

Special Conservation Interest (SCI)	Conservation Objective
Whooper swan	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
Eurasian wigeon	
European golden plover	
Northern lapwing	
Greenland white-fronted goose	
Wetland and waterbirds	To maintain or restore the favourable conservation condition of the wetland habitat at River Suck Callows SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

5.2.2.6.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to affect the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-13.

Table 5-13: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
High	A04	Grazing	Outside
Low	F03.01	Hunting	Inside
Medium	A03	Mowing / cutting of grassland	Inside
High	A08	Fertilisation	Outside

[34] *NPWS (2022) Conservation objectives for River Suck Callows SPA [004097]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Medium	A04	Grazing	Inside
Medium	G01.01	Nautical sports	Inside
Low	F02.03	Leisure fishing	Inside
Medium	A08	Fertilisation	Inside
Low	B	Sylviculture, forestry	Outside
Medium	E01.03	Dispersed habitation	Outside

The Proposed Development will not affect any of the site-specific threats, pressures and activities listed above. Grazing, mowing/cutting of grassland, fertilisation and sylviculture are agricultural activities unrelated to and independent from the Proposed Development. Similarly, hunting, nautical sports and leisure fishing are activities that will be unaffected by the Proposed Development. Dispersed habitation is also independent from the Proposed Development and is controlled by the local planning authority.

5.2.2.6.3 *Special Conservation Interests (as brought forward from Section 5.1.6)*

The following information has been extracted from the NPWS Natura 2000 Data Form (NPWS, 2018) and I-WeBS results for River Suck Callows SPA for the relevant species:

Whooper swan

- Reference population at designation (1996): 124
- Mean population 2014/15 – 2017/18: 200 (I-WeBS)

Eurasian wigeon

- Reference population at designation (1996): 1,203
- Mean population 2014/15 – 2017/18: 1,311 (I-WeBS)

European golden plover

- Reference population at designation (1996): 2,241
- Mean population 2014/15 – 2017/18: 835 (I-WeBS)

Northern lapwing

- Reference population at designation (1996): 3,640
- Mean population 2014/15 – 2017/18: 1,431 (I-WeBS)

Greenland white-fronted goose

- Reference population at designation (1996): 386
- Mean population 2014/15 – 2017/18: 28 (I-WeBS)

Wetland and waterbirds

The following relevant information has been extracted from the NPWS site synopsis for the SPA (NPWS. 2014[35]) with the full synopsis shown in Appendix 9:

> *"The River Suck Callows SPA is a linear, sinuous site comprising a section of the River Suck from Castlecoote, Co. Roscommon to its confluence with the River Shannon close to Shannonbridge, a distance of approximately 70 km along the course of the river. The river forms part of the boundary between Counties Galway and Roscommon. The site includes the River Suck itself and the adjacent areas of seasonally-flooded semi-natural lowland wet callow grassland. The River Suck is the largest tributary of the River Shannon."*

5.2.2.7 Four Roads Turlough SPA [004140]

The Conservation Objectives document and Natura 2000 Data Form for this site, as available on the NPWS website, were reviewed during this assessment. Information in relation to the conservation objectives of the SCIs and site-specific pressures and threats for the SPA is detailed below.

As identified in Section 5.1 and summarised in Table 5-1, the following SCI species were screened in because they were recorded during surveys (with likely ecological connectivity between the SPA and Proposed Development) and could be negatively affected by disturbance/displacement (construction, operational and decommissioning phases) and/or collision mortality/barrier effects (operational phase):

- European golden plover
- Greenland white-fronted goose

The Proposed Development is located entirely outside the designated site, so there will be no direct effects from habitat loss or damage. As identified in Section 5.1 and summarised in Table 5-1, the following SCI was screened in owing to hydrological connectivity between the Proposed Development and the SPA with the potential for negative indirect effects via a reduction in water quality, reduction in volume or change in flow path:

- Wetland and Waterbirds habitat

5.2.2.7.1 *Review of Conservation Objectives*

The relevant SCIs and the associated generic conservation objectives are presented in

Table 5-14. These have been taken from the NPWS (Version 9.0, 2022) Conservation Objectives for Four Roads Turlough SPA. This document has been reviewed in the preparation of this NIS and additional species/habitat specific information is also provided in the subsequent paragraphs and sections.

No specific attributes or targets for the SCIs are provided in the Generic Conservation Objectives document. However, supplementary information has been taken from the Irish Wetland Bird Survey (I-WeBS) scheme and other relevant sources, which provide the best-available and most-recent baseline population estimates for each SCI species of the named SPA. These estimates form the basis for further assessment.

[35] *NPWS, 2015, Site Synopsis, River Suck Callows SPA, Site code: 004097, Online, Available at: https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004097.pdf*

Table 5-14: Special Conservation Interests and Conservation Objectives (Version 9.0, 2022[36])

Special Conservation Interest (SCI)	Conservation Objective/ SPA Selection Feature Objectives
European golden plover	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
Greenland white-fronted goose	
Wetland and Waterbirds	To maintain or restore the favourable conservation condition of the wetland habitat at Four Roads Turlough SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

5.2.2.7.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to affect the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-15.

Table 5-15: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Medium	A04	Grazing	Inside

The Proposed Development will not affect any of the site-specific threats, pressures and activities listed above. Grazing is an agricultural activity unrelated to and independent from the Proposed Development.

5.2.2.7.3 Special Conservation Interests (as brought forward from Section 5.1.7)

The following information has been extracted from the NPWS Natura 2000 Data Form (NPWS, 2018) and I-WeBS results for Southern Roscommon Lakes (of which Four Roads Turlough SPA is a part of) for the relevant species:

European golden plover

- Reference population at designation (2010): 3,717
- Mean population 2008/09 – 2017/18: 3,625 (I-WeBS)

Greenland white-fronted goose

- Reference population at designation (2010): 93
- Mean population 2008/09 – 2017/18: 41 (I-WeBS)

[36] *NPWS (2022) Conservation objectives for Four Roads Turlough SPA [004140]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

Wetland and waterbirds

The following relevant information has been extracted from the NPWS site synopsis for the SPA (NPWS. 2010[37]) with the full synopsis shown in Appendix 9:

> *"Four Roads Turlough (also known as Cloonlaughnan Turlough) is located 6 km south of Athleague, Co. Roscommon and just over 2 km east of the River Suck. It lies below a low scarp of limestone hills and is an open, shallow basin without permanent standing water which floods regularly and dries out early.".*

5.2.2.8 Lough Ree SPA (004064)

The Conservation Objectives document and Natura 2000 Data Form for this site, as available on the NPWS website, were reviewed during this assessment. Information in relation to the conservation objectives of the SCIs and site-specific pressures and threats for the SPA is detailed below.

As identified in Section 5.1 and summarised in Table 5-1, the following SCI species were screened in because they were recorded during surveys (with likely ecological connectivity between the SPA and Proposed Development) and could be negatively affected by disturbance/displacement (construction, operational and decommissioning phases) and/or collision mortality/barrier effects (operational phase):

- Eurasian wigeon
- Eurasian teal
- Mallard
- Common scoter
- Eurasian coot
- European golden plover
- Northern lapwing

As identified in Section 5.1 and summarised in Table 5-1, the following SCIs were screened out owing to a lack of ecological and hydrogeological connectivity and so are not discussed further in this section:

- Little grebe
- Whooper swan
- Northern shoveler
- Tufted duck
- Goldeneye
- Common tern
- Wetland and waterbirds habitat

5.2.2.8.1 *Review of Conservation Objectives*

The relevant SCIs and the associated generic conservation objectives are presented in Table 5-16. These have been taken from the NPWS (Version 9.0, 2022) Conservation Objectives for Lough Ree SPA. This document has been reviewed in the preparation of this NIS and additional species/habitat specific information is also provided in the subsequent paragraphs and sections.

No specific attributes or targets for the SCIs are provided in the Generic Conservation Objectives document. However, supplementary information has been taken from the Irish Wetland Bird Survey (I-WeBS) scheme and other relevant sources, which provide the best-available and most-recent baseline population estimates for each SCI species of the named SPA. These estimates form the basis for further assessment.

[37] *NPWS, 2010, Site Synopsis, Four Roads Turlough SPA, Site code: 004140, Online, Available at:* https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004140.pdf

Table 5-16: Special Conservation Interests and Conservation Objectives (Version 9.0, 2022[38])

Special Conservation Interest (SCI)	Conservation Objective/ SPA Selection Feature Objectives
Eurasian wigeon	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
Eurasian teal	
Mallard	
Common scoter	
Eurasian coot	
European golden plover	
Northern lapwing	

5.2.2.8.2 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to affect the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-17.

Table 5-17: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
High	G01.01	Nautical sports	Inside
High	A04	Grazing	Outside
Medium	F02.03	Leisure fishing	Inside
Medium	G01.02	Walking, horse riding and non-motorised vehicles	Outside
Low	B	Sylviculture, forestry	Outside
Medium	A08	Fertilisation	Outside
Low	F03.01	Hunting	Inside
Medium	I01	Invasive non-native species	Inside

[38] *NPWS (2022) Conservation objectives for Lough Ree SPA [004064]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

The Proposed Development will not affect any of the site-specific threats, pressures and activities listed above. Grazing, fertilisation and sylviculture are agricultural activities unrelated to and independent from the Proposed Development. Similarly, nautical sports, leisure fishing and walking/horse riding/non-motorised vehicles are activities that will be unaffected by the Proposed Development. No invasive species were recorded within the Proposed Development including along the Grid Connection route (see Section 4.2), and good practice management measures to prevent the spread of invasive species from outside of the Proposed Development site are provided within Section 3.6 of the CEMP (see Appendix 2). Consequently, the Proposed Development cannot affect the spread of invasive non-native species within the SPA.

5.2.2.8.3 *Special Conservation Interests (as brought forward from Section 5.1.8)*

The following information has been extracted from the NPWS Natura 2000 Data Form (NPWS, 2018), I-WeBS results for Lough Ree SPA and the 2012 breeding survey of common scoter (Hunt *et al.*, 2012) for the relevant species:

Eurasian wigeon

- Reference population at designation (1995): 1,475
- Mean population 2013/14 – 2017/18: 17 (I-WeBS)

Eurasian teal

- Reference population at designation (1995): 912
- Mean population 2013/14 – 2017/18: 24 (I-WeBS)

Mallard

- Reference population at designation (1995): 675
- Mean population 2013/14 – 2017/18: 29 (I-WeBS)

Common scoter

- Reference population at designation (1995): 35
- Population in 2012: 10 breeding birds (Hunt *et al.*, 2012).

Eurasian coot

- Reference population at designation (1995): 675
- Mean population 2013/14 – 2017/18: 99 (I-WeBS)

European golden plover

- Reference population at designation (1995): 2,035
- Mean population 2013/14 – 2017/18: 1,127 (I-WeBS)

Northern lapwing

- Reference population at designation (1995): 3,870
- Mean population 2013/14 – 2017/18: 608 (I-WeBS)

5.2.2.9 Middle Shannon Callows SPA [004096]

The Conservation Objectives document and Natura 2000 Data Form for this site, as available on the NPWS website, were reviewed during this assessment. Information in relation to the conservation objectives of the SCIs and site-specific pressures and threats for the SPA is detailed below.

As identified in Section 5.1 and summarised in Table 5-1, the following SCI species were screened in because they were recorded during surveys (with likely ecological connectivity between the SPA and Proposed Development) and could be negatively affected by disturbance/displacement (construction, operational and decommissioning phases) and/or collision mortality/barrier effects (operational phase):

- Eurasian wigeon
- European golden plover
- Northern lapwing
- Black-headed gull

As identified in Section 1.1.1, the following SCI species were screened out owing to a lack of connectivity and so are not discussed further in this section:

- Whooper swan
- Corncrake
- Black-tailed godwit

The Proposed Development is located entirely outside the designated site, so there will be no direct effects from habitat loss or damage. As identified in Section 5.1 and summarised in Table 5-1, the following SCI was screened in owing to hydrogeological connectivity between the Proposed Development and the SPA with the potential for negative indirect effects via a reduction in water quality, reduction in volume or change in flow path:

- Wetland and waterbirds habitat

5.2.2.9.1 *Review of Conservation Objectives*

The relevant SCIs and the generic conservation objectives are presented in Table 5-18. These have been taken from the NPWS (Version 9.0, 2022) Conservation Objectives for Middle Shannon Callows SPA. This document has been reviewed in the preparation of this NIS and additional species/habitat specific information is also provided in the subsequent paragraphs and sections.

No specific attributes or targets for the SCIs are provided in the Generic Conservation Objectives document. However, supplementary information has been taken from the Irish Wetland Bird Survey (I-WeBS) scheme and other relevant sources, which provide the best-available and most-recent baseline population estimates for each SCI species of the named SPA. These estimates form the basis for further assessment.

Table 5-18: Special Conservation Interests and Conservation Objectives (Version 9.0, 2022[39])

Special Conservation Interest (SCI)	Conservation Objective
Eurasian wigeon	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
European golden plover	
Northern lapwing	

[39] *NPWS (2022) Conservation objectives for Middle Shannon Callows SPA [004096]. Generic Version 9.0. Department of Housing, Local Government and Heritage.*

Special Conservation Interest (SCI)	Conservation Objective
Black-headed gull	
Wetland and waterbirds	To maintain the favourable conservation condition of the wetland habitat at Middle Shannon Callows SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

5.2.2.9.2 *Review of site-specific pressures and threats*

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to affect the SPA were reviewed and considered in relation to the Proposed Development. These are provided in Table 5-19.

Table 5-19: Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Low	A04.03	Abandonment of pastoral systems, lack of grazing	Inside
High	E01	Urbanised areas, human habitation	Outside
High	G01.01	Nautical sports	Inside
Low	F03.01	Hunting	Inside
Medium	G01.02	Walking, horseriding and non-motorised vehicles	Inside
High	D01.05	Bridge, viaduct	Inside
Medium	A08	Fertilisation	Outside
High	A04	Grazing	Inside
Low	A08	Fertilisation	Inside
Medium	F02.03	Leisure fishing	Inside
Low	D01.01	Paths, tracks, cycling tracks	Inside

The Proposed Development will not affect any of the site-specific threats, pressures and activities listed above. Pastoral systems, grazing and fertilisation are agricultural activities unrelated to and independent from the Proposed Development. Nautical sports, hunting, walking/horse riding/non-motorised vehicles and leisure fishing are leisure activities that are unrelated to and independent from the Proposed Development. The Proposed Development will not affect urbanisation, the creation of bridges/viaducts or paths/tracks/cycling tracks, as they are under the control of the local planning authority.

5.2.2.9.3 *Special Conservation Interests (as brought forward from 5.1.9)*

The following information has been extracted from the NPWS Natura 2000 Data Form (NPWS, 2020) and the I-WeBS results for Shannon Callows I-WeBS site (of which the Middle Shannon Callows SPA forms part of) for the relevant species:

Eurasian wigeon

- Reference population at designation (1996) 2,972:
- Mean population 2010/11 – 2017/18: 405 (I-WeBS site Shannon Callows)

European golden plover

- Reference population at designation (1996): 4,254
- Mean population 2010/11 – 2017/18: 576 (I-WeBS site Shannon Callows)

Northern lapwing

- Reference population at designation (1996): 3,640
- Mean population 2010/11 – 2017/18: 1,431 (I-WeBS site Shannon Callows)

Black-headed gull

- Reference population at designation (1996) 1,061:
- Mean population 2010/11 – 2017/18: 292 (I-WeBS site Shannon Callows)

Wetlands and Waterbirds

The following relevant information has been extracted from the NPWS site synopsis for the SPA[40] with the full synopsis shown in Appendix 9:

> *"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."*

[40] *NPWS, 2012, Site Synopsis, Middle Shannon Callows SPA, Site code: 004096, Online, Available at: http://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004096.pdf*

6. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

This Natura Impact Statement presents the data and information on the Proposed Development and provides an analysis comprising the scientific examinations of the Proposed Development and its implications for the European sites referred to above in view of their conservation objectives, and provides an analysis of whether the Proposed Development, in light of best scientific information, individually or in combination with other plans or projects, would adversely affect the integrity of a European Site. . Potential adverse effects are assessed in view of best scientific knowledge, based on objective information in relation to the Proposed Development including the proposed avoidance, reduction and preventive measures.

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

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

From a highly precautionary perspective, potential for indirect disturbance/displacement effects have also been identified in relation to otter, where they occur outside of EU designated sites i.e. River Shannon Callows SAC [000216].

Potential for ex-situ disturbance, displacement, barrier effects, mortality via collision with operational turbines and inadvertent destruction of nests have been considered in Sections 6.1.5 - 6.1.9 for the SCI bird species associated with Lough Croan Turlough SPA, River Suck Callows SPA, Four Roads Turlough SPA, Lough Ree SPA and Middle Shannon Callows SPA that have been screened in for detailed assessment (see Section 5.1 and summarised in Table 5-1).

Effects during construction and operation are assessed in Sections 6.1.5 - 6.1.9. Potential effects associated with decommissioning of the Proposed Development are assumed to be similar to, albeit somewhat reduced to those identified for construction phase (i.e. potentially disturbance/ displacement but not habitat loss). Decommissioning effects are therefore not considered separately in Sections 6.1.5 - 6.1.9.

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). In the absence of mitigation, wetland habitats within such sites could be affected by the Proposed Development via deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. 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.

The below sections provide an assessment of the potential for impacts on European Sites and associated mitigation, although note that for SCI bird species, no specific mitigation measures are considered necessary and so an assessment of the unmitigated effects has been made only.

6.1 Potential for Impacts on the European Sites

6.1.1 Potential effects on Ballynamona Bog and Corkip Lough SAC

An assessment is presented below in relation to potential for direct and indirect effects on the relevant QIs of Ballynamona Bog and Corkip Lough SAC in light of its conservation objectives, as a result of the Proposed Development.

6.1.1.1 Direct Effects

No pathway for direct effects on this SAC as a result of the Proposed Development have been identified (see Section 3.1.9 for rationale). There is therefore no requirement for further assessment relating to potential direct impact of the Proposed Development on this SAC.

6.1.1.2 Indirect Effects

An assessment is presented in Table 6-1 below in relation to potential indirect effects on the relevant QIs of Ballynamona Bog and Corkip Lough SAC, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-1: Summary of potential indirect effects on Ballynamona Bog and Corkip Lough SAC

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[3180] Turloughs	"To restore the favourable conservation condition of Turloughs in Ballynamona Bog	As detailed within the 'Turloughs' supporting document for the SAC	Turbines T19 & T20 of the Proposed Development are considered to be upgradient of Corkip Lough. There is therefore potential for surface and	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term reversible impact on watercourses which act as a conduit to downstream habitats. The magnitude of

	and Corkip Lough SAC"	(NPWS, 2016[41]): "*Corkip Lough is in the north-west of the SAC. There are limited data available on the turlough, which is considered important owing to its hydrological linkage to the raised bog and the presence of interesting plant and invertebrate species*" <u>Hydrological Regime</u> Maximum water levels have been derived from the high water mark on aerial photography of the turlough area, which is at ~57 m OD. Both the full extent of flooding and the wetland vegetation is currently unknown, and little is also known about the hydrological regime of Corkip Lough.	ground water quality deterioration resulting from release of pollutants including suspended solids and hydrocarbons, associated with the construction, operation and decommissioning of the proposed project.	any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse.
			Potential for alteration of hydrological regime of turlough habitat which could result from the following: › Alteration of groundwater volumes through alterations of recharge patterns; › Alteration of groundwater flowpaths which feed the turloughs through excavation / emplacement works; and › Alteration of groundwater quality due to silt,	Corkip Lough is situated ~1km southeast of T20 and ~1.4km southeast of T19. The site investigation data near T19 and T20 indicates that there is >10m of subsoil overburden at these turbine locations, providing a considerable thickness of protection to the underlying groundwater aquifer. The local subsoil (at T19 and T20) is logged as sandy gravelly CLAY, sandy GRAVEL and clayey sandy COBBLES. Maximum groundwater levels near Corkip Lough range between 57.01 – 58.8 m OD in Winter. There is a very shallow valley on the eastern side of Cam Hill which slopes in a south-easterly direction. T19 and T20 are situated just inside the boundaries of this valley. The shallow valley broadly trends in the direction of Corkip Lough, therefore

[41] *NPWS, 2016. Ballynamona Bog and Corkip Lough SAC (site code 2339). Conservation objectives supporting document: Turloughs. Version 1, May 2016*

			cementitious material/hydrocarbons entering the groundwater system below the Wind Farm Site.	groundwater from near T19/T20 will likely drain towards Corkip Lough. In the absence of mitigation potential impacts have been assessed as indirect, negative, moderate, short term, unlikely impact to groundwater fed turloughs (see Section 4.3.2 (see also Section 9.4.2.9.1 of the hydrological assessment (provided as Appendix 3).

Based on the assessment presented in Table 6-1 in relation to direct effects on its QIs, in the absence of mitigation there is potential be for effects on the relevant groundwater dependant habitats and therefore adverse impacts to the integrity of Ballynamona Bog and Corkip Lough SAC, in light of its conservation objectives, as a result of the Proposed Development. This has been identified on a precautionary basis, as detailed hydrological assessment concluded that any effects are not likely to be significant (see Section 4.4 (also Section 9.4.2.9 of Appendix 3). Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.2 Potential effects on Killeglan Grassland SAC

An assessment is presented below in relation to potential for direct and indirect effects on the relevant QIs of Killeglan Grassland SAC, in light of its conservation objectives, as a result of the Proposed Development.

6.1.2.1 Direct Effects

Direct effects on this SAC as a result of the Proposed Development have been ruled out (see Section 3.1.9 for rationale). There is therefore no requirement for further assessment relating to potential direct impact of the Proposed Development on this SAC.

6.1.2.2 Indirect Effects

An assessment is presented in Table 6-2 below in relation to potential indirect effects on the relevant QIs of Killeglan Grassland SAC.

Table 6-2: Summary of potential indirect effects on Killeglan Grassland SAC

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites)	"To restore the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)* (* important orchid sites) in Killeglan Grassland SAC"	As described within the Conservation Objectives document for the SAC (NPWS, 2018), The total current area of semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) in Killeglan Grassland SAC is unknown. As part of the Grasslands Monitoring Project 2006, the habitat was surveyed by Dwyer et al. (2007) who stated that the habitat is well-distributed throughout the SAC and occurs in association with patches of scrub, shattered limestone pavement and outcropping limestone boulders, with the best example of the habitat occurring in the central area of the SAC on relatively flat shallow soils. More scattered occurrences are located in a mosaic with scrub along the western and northern boundaries (Dwyer et al., 2007).	Deterioration of QI habitat resulting from wind blown dust contamination during the construction phase of the Proposed Development.	In the absence of mitigation, the indirect effect of dust contamination of QI grassland habitat has the potential to result in a short-term slight negative impact.

		For the purposes of this NIS it is assumed that this habitat occurs within the entirety of the SAC.		

Based on the assessment presented in Table 6-2 in relation to indirect effects on the QI of this SAC the potential for effect on the QI habitat of the SAC has been identified on a precautionary basis; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Killeglan Grassland SAC, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.3 Potential effects on Four Roads Turlough SAC

An assessment is presented below in relation to potential for direct and indirect effects on the relevant QIs of Four Roads Turlough SAC, in light of its conservation objectives, as a result of the Proposed Development.

6.1.3.1 Direct Effects

Direct effects on this SAC as a result of the Proposed Development have been ruled out (see Section 3.1.9 for rationale). There is therefore no requirement for further assessment relating to potential direct impact of the Proposed Development on this SAC.

6.1.3.2 Indirect Effects

An assessment is presented in Table 6-3 below in relation to potential indirect effects on the relevant QIs of Four Roads Turlough SAC.

Table 6-3: Summary of potential indirect effects on Four Roads Turlough SAC

Special Conservation Interests for which	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment

European Site has been designated				
[3180] Turloughs	"To restore the favourable conservation condition of Turloughs in Four Roads Turlough SAC"	As described within the Conservation Objectives document for the SAC (NPWS, 2018), the Approximate area of Four Roads (or Cloonloughlin) turlough within the Four Roads Turlough SAC is 72.1ha based on Goodwillie (1992). Goodwillie (1992) described Four Roads turlough as "a very flat basin, subject to less frequent flooding than the nearby Lisduff turlough (in Lisduff Turlough SAC 000610). <u>Hydrological Regime</u> Goodwillie (1992) described Four Roads turlough as an apparently dry site and stated that standing water remains longest at the western end where there was a narrow pond in April. It appears to flood quite predictably and dry out early according to NPWS data referred to in the Conservation Objectives document for the SAC.	Potential surface and ground water quality deterioration resulting from release of pollutants including suspended solids and hydrocarbons, associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term reversible impact on watercourses which act as a conduit to downstream habitats. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse.
			Alteration of local hydrological regime influencing that of the turlough habitat	Groundwater levels at Four Roads Turlough SAC range between 47.8 -48.6 m OD from the historical data, with maximum water level estimated at ~51m OD (GSI GWFlood Data). Groundwater flow from near turbines T1 and T2 are >76 m OD, with water levels recorded between Four Roads and the Northern Cluster of 61.6-65.5 m OD. There are 2 no. watercourses which emerge between Four Roads turlough and the Northern Cluster and any groundwater which may flow north/northwest from the site is more likely to emerge as baseflow

				in these, however the possibility of groundwater reaching Four Roads Turlough cannot be discounted. In the absence of mitigation, the indirect effect of groundwater levels on this QI during construction has the potential be a short-term reversible impact on the habitat.

Based on the assessment presented in Table 6-3 in relation to indirect effects on the SAC, the potential for effect on the QI habitat of the SAC has been identified on a precautionary basis; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Four Roads Turlough SAC, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.4 River Shannon Callows SAC

An assessment is presented below in relation to potential for direct and indirect effects on the relevant QIs of the River Shannon Callows SAC, in light of its conservation objectives, as a result of the Proposed Development.

6.1.4.1 Potential for Direct Effects

An assessment is presented in Table 6-4 below in relation to potential indirect effects on the relevant QIs of the River Shannon Callows SAC.

Table 6-4: Summary of potential direct effects on River Shannon Callows SAC

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment

[1355] Otter (*Lutra lutra*)	"To maintain the favourable conservation condition of Otter (*Lutra lutra)* in River Shannon Callows SAC"	The suitable habitat for otter within the SAC itself is mapped in the Conservation Objectives document to include 10m terrestrial buffer along shorelines and river banks identified as critical for otters (NPWS, 2007). However male otters may occupy a linear range of up to 13.2km in length in the case of male animals[42], and therefore it is possible that otters utilising watercourses along and downstream of the Grid Connection route may be associated with the SAC population. Although signs of otter were recorded during surveys within the study area i.e. a spraint recorded on a single location along the Cross River where it flows beneath the proposed Grid Connection route, no otter holts were recorded and it is therefore likely that the watercourses occurring within the site do not support a significant otter population.	Potential direct disturbance to otter associated with noise/ vibration from construction/ maintenance works in close proximity to watercourses associated with the construction, operation and decommissioning phases of the Proposed Development.	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term impact on watercourses which act as a conduit to downstream habitats. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse and works along the Grid Connection route will be relatively low impact works to existing crossings. Taking a precautionary approach, a potential pathway for indirect effects on otter associated with the River Shannon Callows SAC has been identified as a result of disturbance associated with the construction, operation and decommissioning phases of the proposed works. Due to the use of the riparian habitat along the Grid Connection route by otter, the potential for disturbance to the otter population associated with the River Shannon Callows SAC is considered below. Otter are crepuscular in nature, and are unlikely to be adversely impacted by the

[42] *Ó Néill L. (2008) Population dynamics of the Eurasian otter in Ireland. Integrating density and demography into conservation planning. PhD thesis. Trinity College, Dublin*

				proposed works, especially given the relatively low-impact nature ofthe Proposed Development . The NPWS Threat Response Plan for Otter acknowledges that "Little evidence has come to light in recent studies to suggest that disturbance by recreation is a significant pressure." It also identifies that Otter are known to travel significant distances from streams and lakes in search of new territory and feeding areas. Chanin P (2003) provides a literary review with regard to anthropogenic disturbance and refers to several reports which have found that disturbance is not detrimental to Otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). The report also describes successful breeding in towns, under ferry terminals and under the jetties of one of Europe's largest oil and gas terminals at Sullom Voe in North Scotland. Irish Wildlife Manual No 23 (National Otter Survey of Ireland 2004/2005) found no significant relationship between disturbance and otter occurrence. In addition, no significant difference in otter presence was found between sites with and without recreational activity. It also states, "the lowest percentage occurrence

				was found at the sites with the lowest recorded disturbance!" Irish Wildlife Manual No 76 (National Otter Survey of Ireland 2010/2012) notes that the occurrence of Otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey & Rochford, 2006). No breeding, resting or foraging sites for otter will be impacted. In addition, there is no potential for the Proposed Development to result in any barrier to the movement of aquatic species. Best practice disturbance limitation measures have been included in the project design and are described in Section 5.2.2.1 below. Based on the above review of scientific literature, and on the best practice disturbance limitation measures to be put in place, the potential for adverse impact on the integrity of the otter population associated with the River Shannon Callows SAC is not anticipated.

Based on the assessment presented in Table 6-4 in relation to direct effects on QIs, the potential for effect on the identified QIs of the SAC has been identified on a precautionary basis; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of River Shannon Callows SAC, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.4.2 Indirect Effects

An assessment is presented in Table 6-5 below in relation to potential indirect effects on the relevant QIs of the River Shannon Callows SAC.

Table 6-5: Summary of potential indirect effects on River Shannon Callows SAC

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[7230] Alkaline fens	"To maintain the favourable conservation condition of Alkaline fens in River Shannon Callows SAC"	As described within the Conservation Objectives document for the SAC (NPWS, 2022), the area of alkaline fen in the SAC has been mapped as c.15ha based on Heery and Mayes (2012), however further unsurveyed areas of the habitat may be present within the SAC. <u>Hydrology</u> Fen groundwater levels are controlled by regional groundwater levels. In this SAC, the fen may partly be fed by springs, and there is some evidence of base-rich	Potential habitat deterioration resulting from release of pollutants including suspended solids and hydrocarbons, associated with the construction, operation and decommissioning phases of the Proposed Development.	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term reversible impact on the habitat. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse and the works at watercourse crossings along the Grid Connection route will be relatively low impact works to existing crossings.

		flushing on sloping ground with outcropping rock to the west of the fen (Heery and Mayes, 2012)	Alteration of local hydrological regime due to increased discharge to groundwater; any change in hydrological regime could potentially result in drainage or increased flooding of fen habitat.	In the absence of mitigation, the indirect effect of groundwater levels on this QI during construction has the potential be a short-term reversible impact on the habitat.
[91E0] Alluvial forests with *Alnus glutinosa* 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".	According to the site specific Conservation Objectives (NPWS, 2022), 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	Potential habitat deterioration resulting from release of pollutants including suspended solids and hydrocarbons, associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term reversible impact on this habitat. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse and works along the Grid Connection route will be relatively low impact works to existing crossings.

		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. <u>Hydrology</u> The riverbanks and alluvial islands where the habitat is known to occur in the SAC are prone to periodic flooding (NPWS, 2022). Periodic flooding is essential to maintain alluvial woodlands along river and lake floodplains (but not for woodland around springs/seepage areas).	Alteration of local hydrological regime due to disruption of river flow, increased runoff or discharge from the development during the construction, operational and decommissioning phases; this could potentially result in drainage or increased flooding of alluvial forest habitat.	In the absence of mitigation, the indirect effect of groundwater levels on this QI during construction has the potential be a short-term reversible impact on the habitat.
[1355] Otter (*Lutra lutra*)	"To maintain the favourable conservation condition of Otter (*Lutra lutra*) in River Shannon Callows SAC"	The suitable habitat for otter within the SAC itself is mapped in the Conservation Objectives document to include 10m terrestrial buffer along shorelines and river banks identified as critical for otters (NPWS, 2007) However otters may occupy a linear range of up to a maximum of 50km in exceptional cases, and therefore it is possible that otters utilising watercourses along and downstream of the Grid Connection route may be associated with the SAC population.	Potential habitat deterioration, reduction of prey species and reduction in body condition resulting from release of pollutants including suspended solids and hydrocarbons, associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this QI during construction has the potential be a short-term impact on watercourses which act as a conduit to downstream habitats. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse and works along the Grid Connection route will be relatively low impact works to existing crossings.

		Although signs of otter were recorded during surveys within the study area i.e. a spraint recorded on a single location along the Cross River where it flows beneath the proposed Grid Connection route, no otter holts were recorded and it is therefore likely that the watercourses occurring within the site do not support a significant otter population.	Potential indirect disturbance to otter associated with noise/ vibration from construction/ maintenance works associated with the construction, operation and decommissioning in close proximity to watercourses.	Taking a precautionary approach, a potential pathway for indirect disturbance effects on otter associated with the River Shannon Callows SAC has been identified as a result of disturbance associated with the construction, operation and decommissioning phases of the proposed works Due to the use of the riparian habitat along the Grid Connection route by otter, the potential for disturbance to the otter population associated with the River Shannon Callows SAC is considered below. Otter are crepuscular in nature, and are unlikely to be adversely impacted by the proposed works, especially given the relatively low-impact nature of the Proposed Development. The NPWS Threat Response Plan for Otter acknowledges that "Little evidence has come to light in recent studies to suggest that disturbance by recreation is a significant pressure." It also identifies that Otter are known to travel significant distances from streams and lakes in search of new territory and feeding areas. Chanin P (2003) provides a literary review with regard to anthropogenic disturbance and refers to several reports

				which have found that disturbance is not detrimental to Otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). The report also describes successful breeding in towns, under ferry terminals and under the jetties of one of Europe's largest oil and gas terminals at Sullom Voe in North Scotland. Irish Wildlife Manual No 23 (National Otter Survey of Ireland 2004/2005) found no significant relationship between disturbance and otter occurrence. In addition, no significant difference in otter presence was found between sites with and without recreational activity. It also states, "the lowest percentage occurrence was found at the sites with the lowest recorded disturbance!" Irish Wildlife Manual No 76 (National Otter Survey of Ireland 2010/2012) notes that the occurrence of Otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey & Rochford, 2006).

				No breeding, resting or foraging sites for otter will be impacted. In addition, there is no potential for the Proposed Development to result in any barrier to the movement of aquatic species. Best practice disturbance limitation measures have been included in the project design and are described in Section 5.2.2.1 below. Based on the above review of scientific literature, and on the best practice disturbance limitation measures to be put in place, the potential for adverse impact on the integrity of the otter population associated with the River Shannon Callows SAC is not anticipated.

Based on the assessment presented in Table 6-5 in relation to indirect effects on QIs, there will be the potential for effect on the identified QIs of the SAC has been identified on a precautionary basis; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of River Shannon Callows SAC, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.5 Potential effects on Lough Croan Turlough SPA

An assessment is presented below in relation to potential for direct and indirect effects on the relevant SCIs of Lough Croan Turlough SPA in light of its conservation objectives, as a result of the Proposed Development.

6.1.5.1 Direct Effects

An assessment is presented in Table 6-6, below, in relation to potential direct effects on the relevant SCI bird species of Lough Croan Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-6. Summary of potential direct effects on Lough Croan Turlough SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A140] European Golden Plover *Pluvialis apricaria* (wintering)	"To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"	<u>SPA population (wintering; national importance)</u> › Reference population at designation (2010): 2,025 › Mean population 2008/09 - 2017/18: 3,625 (data for I-WeBS site Southern Roscommon Lakes) <u>Current survey data</u> › Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI is predicted, as activity was concentrated at Thomas Street Turlough and Feacle Turlough, outside the Proposed Development site and located 730 m and 948 m from the nearest turbine location, respectively.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and	The core foraging distance for wintering European golden plover is up to 12 km (Gillings *et al.*, 2007). As the SPA is 1.03 km from the

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter 2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. › European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety	other infrastructure during operation	wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters is 1.279 per year during the non-breeding season. In the context of background annual adult mortality of 27% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.2% (for the mean 2008/09 – 2017/18 population of the Southern Roscommon Lakes I-WeBS site and 2010 SPA reference population, respectively), assuming all birds recorded are from the SPA population.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		risk to surveyors working in such terrain at night). <u>Pre-existing survey data</u> › Recorded in all years.		An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. The intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds are likely to become habituated to turbine presence and human presence is likely to be very low overall. The closest key wetland sites used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. The intervening distances, the abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational disturbance effects are likely for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (wintering)		SPA population (wintering; national importance) › Reference population at designation (2010): 164 › Mean population 2008/09 - 2017/18: 41 (data for I-WeBS site Southern Roscommon Lakes) Current survey data › Swan and goose feeding distribution surveys: only recorded in one monthly survey (179 in February 2021 with three separate flocks grazing in fields surrounding Lough Croan, which is located beyond the 1 km survey buffer at 1.5 km distance from the Proposed Development). › Greenland white-fronted goose roost surveys: irregularly recorded at Lough Croan, but with a peak of 267 in January 2021. Birds did not overfly either of the wind farm Clusters, which lie to the south of Lough Croan	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Lough Croan and beyond, at least 1 km outside the Proposed Development site.
			Inadvertent destruction of nests during construction	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering Greenland white-fronted goose is up to 8 km (SNH, 2016). As the SPA is 1.03 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		(i.e. all flights were of birds heading east-west into or away from Lough Croan or north from Lough Croan.) › Northern Cluster flight activity surveys: two flocks in winter 2018/19 (5 & 14); one flock of 72 in winter 2019/20 outside the Proposed Development site leaving Lough Croan heading towards the River Suck Callows; none in winter 2020/21. › Southern flight activity surveys: none in winter 2018/19; none in winter 2019/20; one flock of 50 in winter 2020/21 recorded outside the Proposed Development site. <u>Pre-existing survey data</u> › Not recorded at the Proposed Development site but recorded in surrounding area (in 2013 and 2016 only, with no identifiable trend in numbers of over the course of the surveys).		Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The annual collision rate for this species at the Northern Cluster only (insufficient data were available to model the Southern Cluster) is 0.0054 per year during the non-breeding season. In the context of background annual adult mortality of 28% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.4% (for the 2010 SPA reference population and mean 2008/09 – 2017/18 population of the Southern Roscommon Lakes I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are important for this SCI species. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development). This means that significant disturbance/displacement is unlikely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			greater energy expenditure), vehicular traffic and the presence of people during operation	A review by Hötker et al. (2006) indicated the disturbance area to wind farms was up to 373 m for geese. Another study by Rees (2012) recorded displacement distances of 30-600 m for geese at terrestrial wind farms. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development) and the number of flights through the Proposed Development site was very low. This means that significant displacement (including barrier effects) is unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Based on the assessment presented in Table 6-6 in relation to direct effects on its SCI bird species, there will be no significant effect on the relevant species and therefore no adverse effects to the integrity of Lough Croan Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.5.2 Indirect Effects

Wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for Lough Croan Turlough SPA (if located within the core foraging range of the SCI species). In the absence of mitigation, wetland habitats within such sites (if hydrologically connected to the Proposed Development) could be affected by pollution associated with construction, operation and decommissioning of the Proposed Development causing a deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. This could, in turn, adversely affect SCI bird species forming part of the Lough Croan Turlough SPA population. Therefore, in the absence of mitigation, significant indirect effects on SCI species are likely.

Based on the assessment presented in the paragraph above in relation to indirect effects on its SCI bird species, the potential for effects has been identified; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Lough Croan Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.6 Potential effects on River Suck Callows SPA

An assessment is presented in Table 6-7 and Table 6-8 respectively in relation to potential direct effects and indirect effects on the relevant SCI features of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.6.1 Direct Effects

An assessment is presented in Table 6-7 below, in relation to potential direct effects on the relevant SCI bird species of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-7: Summary of potential direct effects on River Suck Callows SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A038] Whooper Swan *Cygnus cygnus* (wintering)	"To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"	SPA population (wintering; national importance) › Reference population at designation (1996): 164 › Mean population 2014/15 - 2017/18: 200 (data for SPA I-WeBS site) Current survey data › Swan and goose feeding distribution surveys: max. 189 (March 2021). Two main foraging areas were regularly used: fields near Lough Croan, approximately 1 km north of the Northern Cluster and the Ballyglass River located c. 750 m to the north of the Southern Cluster. › Northern Cluster flight activity surveys: 14 flights with a combined total of 58 (winter 2020/21). Only a single flock of four birds was recorded flying through the Proposed Development site with all others recorded outside the Proposed Development site.	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as all foraging activity was concentrated outside the Proposed Development site, at least 500 m away.
			Inadvertent destruction of nests during construction	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering whooper swans is up to 5 km (SNH, 2016). As the SPA is 2.17 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Southern Cluster flight activity surveys: 8 flights with combined total of 35 (winter 2020/21). None of the birds were recorded flying through the Proposed Development site. <u>Pre-existing survey data</u> › Recorded in all years, mostly in small numbers and often irregularly.		modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at the Northern Cluster and Southern Cluster is 0.228 per year during the non-breeding season. In the context of background annual adult mortality of 19.9% (BTO Birdfacts), this collision rate represents an increase in 0.6-0.9% (for the mean 2014/15 – 2017/18 population at the River Suck Callows I-WeBS site and the 1996 SPA reference population and, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction	None of the habitats predicted to be lost due to the construction of the Proposed Development

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			due to vehicular traffic, operating plant and the presence of construction workers	are particularly important for this SCI species. Most foraging activity for this SCI species was focused >500 m from the Proposed Development. This means that significant displacement is highly unlikely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. A review by Hötker et al. (2006) indicated the disturbance area to wind farms was up to 150 m for swans. Another study by Rees (2012) recorded displacement distances of 200-560 m for swans at terrestrial wind farms. Most foraging activity for this SCI species was focused

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				>500 m from the Proposed Development and the number of flights through the Proposed Development site was low. This means that significant displacement (including barrier effects) is highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A050] Eurasian Wigeon *Mareca penelope* (wintering)		<u>SPA population (wintering; national importance)</u> › Reference population at designation (1996): 1,203 › Mean population 2014/15 - 2017/18: 1,311 (data for SPA I-WeBS site) <u>Current survey data</u> › Northern Cluster flight activity surveys: one record (as secondary target species) of flock of 40-50 (winter 2019/20). One record (as primary target species) of flock of 35 (winter 2020/21).	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Feacle Turlough, outside the Proposed Development site and located 730 m from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Southern Cluster flight activity surveys: two records (as secondary target species) (winter 2019/20), max. flock size 57. Seven records (as primary target species) with combined total of 291 (max. flock size 120) (winter 2020/21), all of which were observed flying over Feacle Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.	Mortality due to collision with turbine blades and other infrastructure during operation	In the absence of specific data for this species the core foraging distance for wintering Eurasian wigeon has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 2.17 km from the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The annual collision rate for this species at the Southern Cluster (insufficient data were available to model the Northern Cluster) is 0.794 per year during the non-breeding season. In the context of background annual adult mortality of 47% (BTO Birdfacts), this collision rate represents an increase in 0.1% (for both the mean 2014/15 – 2017/18 population at the River Suck Callows I-WeBS site and the 1996 SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				reference populations), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances mean that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distance between the closest key wetland sites likely to be used by this species and the low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A140] European Golden Plover *Pluvialis apricaria* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1996): 2,241 › Mean population 2014/15 - 2017/18: 835 (data for SPA I-WeBS site)	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of Wind Farm infrastructure, including the	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		Current survey data › Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter 2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location.	underground Grid Connection	concentrated at Thomas Street Turlough and Feacle Turlough, outside the Proposed Development and located 948 and 730 m from the nearest turbine location respectively.
			Inadvertent destruction of nests during construction	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering European golden plover is up to 12 km (Gillings *et al.*, 2007). As the SPA is 2.17 km from the Wind Farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night). <u>Pre-existing survey data</u> › Recorded in all years.		is 1.279 per year during the non-breeding season. In the context of background annual adult mortality of 27% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.6% (for the 1996 SPA reference population and the mean 2014/15 – 2017/18 population at the River Suck Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances between turbines and areas favoured by this species, the abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A142] Northern Lapwing *Vanellus vanellus* (wintering)		<u>SPA population (wintering; national importance)</u> › Reference population at designation (1996): 3,640 › Mean population 2014/15 - 2017/18: 1,431 (data for SPA I-WeBS site) <u>Current survey data</u> › Northern Cluster flight activity surveys: 11 flights with combined total of 126 (max. flock size of 26) (winter 2018/19); 1 flock of 10 birds (winter 2019/20); 3 flights with combined total of 60 (max. flock size 40) (winter 2020/21). › Southern Cluster flight activity surveys: 6 flights with a combined total of 69 birds (max. flock size 35) (winter 2019/20); 8 flights with a	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI species are predicted, as most activity was concentrated at Feacle Turlough, outside the Proposed Development site and located 730 m from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering northern lapwing is up to 12 km (Gillings *et al.*, 2007). As the SPA is 2.17 km from the wind farm element of the Proposed Development,

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		combined total of 313 (max. flock size 50) (winter 2020/21); combined total of 60 birds (max. flock size 34) (primary target species data) breeding season 2021. Most recorded activity focussed around Feacle Lough Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.		which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both Northern and Southern Clusters is 1.66 per year during the non-breeding season. In the context of background annual adult mortality of 30% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.4% (for the 1996 SPA reference population and the mean 2014/15 – 2017/18 population at the River Suck Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population as a precaution. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1996): 386 › Mean population 2014/15 - 2017/18: 28 (data for SPA I-WeBS site) Current survey data	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Lough Croan and beyond, at least 1 km outside the Proposed Development.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Swan and goose feeding distribution surveys: only recorded in one monthly survey (179 in February 2021 with three separate flocks grazing in fields surrounding Lough Croan, which is located beyond the 1 km survey buffer at 1.5 km distance from the Proposed Development). › Greenland white-fronted goose roost surveys: irregularly recorded at Lough Croan, but with a peak of 267 in January 2021. Birds did not overfly either of the wind farm Clusters, which lie to the south of Lough Croan (i.e. all flights were of birds heading east-west into or away from Lough Croan or north from Lough Croan.) › Northern Cluster flight activity surveys: two flocks in winter 2018/19 (5 & 14); one flock of 72 in winter 2019/20 outside the Proposed Development site leaving Lough	Inadvertent destruction of nests during construction	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering Greenland white-fronted goose is up to 8 km (SNH, 2016). As the SPA is 2.17 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The annual collision rate for this species at the Northern Cluster only (insufficient data were available to model the Southern Cluster) is 0.0054 per year during the non-breeding season.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		Croan heading towards the River Suck Callows; none in winter 2020/21. › Southern flight activity surveys: none in winter 2018/19; none in winter 2019/20; one flock of 50 in winter 2020/21 recorded outside the Proposed Development site. <u>Pre-existing survey data</u> › Not recorded at the Proposed Development site but recorded in surrounding area (in 2013 and 2016 only, with no identifiable trend in numbers over the course of the surveys).		In the context of background annual adult mortality of 28% (BTO Birdfacts), this collision rate represents an increase in <0.1-0.7% (for the 1996 SPA reference population and the mean 2014/15 – 2017/18 population at the River Suck Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population as a precaution. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development). This means that significant disturbance/ displacement are highly unlikely to occur.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. A review by Hötker et al. (2006) indicated the disturbance area to wind farms was up to 373 m for geese. Another study by Rees (2012) recorded displacement distances of 30-600 m for geese at terrestrial wind farms. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development) and the number of flights through the Proposed Development site was very low. This means that significant

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				displacement (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Based on the assessment presented in Table 6-7 in relation to direct effects on its SCI bird species, there will be no significant effect on the relevant species and therefore no adverse effects to the integrity of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.6.2 Indirect Effects

An assessment is presented in Table 6-8 below in relation to potential indirect effects on the relevant SCIs of the River Suck Callows SPA.

Table 6-8: Summary of potential indirect effects on River Suck Callows SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[A999] Wetlands and Waterbirds	"To maintain or restore the favourable conservation condition of the wetland habitat at River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it."	According to the Site Synopsis document for the site, The River Suck Callows SPA is a linear, sinuous site comprising a section of the River Suck from Castlecoote, Co. Roscommon to its confluence with the River Shannon close to Shannonbridge, a distance of approximately 70 km along the course of the river. The river forms part of the boundary between Counties Galway and Roscommon. The site includes the River Suck itself and the adjacent areas of seasonally-flooded semi-natural lowland wet callow grassland. The River Suck is the largest tributary of the River Shannon". The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Whooper Swan, Greenland Whitefronted Goose, Wigeon, Golden Plover and Lapwing. 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.	Potential surface and ground water quality deterioration resulting from pollution associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this SCI has the potential be a short-term reversible impact on groundwater flows which act as a conduit to downstream habitats. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse.

Wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for River Suck Callows SPA (if located within the core foraging range of the SCI species). In the absence of mitigation, wetland habitats within such sites (if hydrologically connected to the Proposed Development) could be affected by pollution associated with construction, operation and decommissioning of the Proposed Development causing a deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. This could, in turn, adversely affect SCI bird species forming part of the River Suck Callows SPA population. Therefore, in the absence of mitigation, significant indirect effects on SCI species are likely.

Based on the assessment presented in Table 6-8 in relation to indirect effects on its SCI wetland habitat, and the paragraph above in relation to indirect effects on its SCI bird species, the potential for effects has been identified; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.7 Potential effects on Four Roads Turlough SPA

An assessment is presented in Table 6-9 and 6-10 respectively in relation to potential direct and indirect effects on the relevant SCI bird species of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.7.1 Direct Effects

An assessment is presented in Table 6-9, below, in relation to potential direct effects on the relevant SCI bird species of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-9: Summary of potential direct effects on Four Roads Turlough SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A140] European Golden Plover *Pluvialis*	"To maintain or restore the favourable	SPA population (wintering; national importance)	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
apricaria (wintering)	conservation condition of the bird species listed as Special Conservation Interests for this SPA"	› Reference population at designation (2010): 3,717 › Mean population 2008/09 - 2017/18: 3,625 (data for I-WeBS site Southern Roscommon Lakes) <u>Current survey data</u> › Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter 2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the	agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Thomas Street Turlough and Feacle Turlough, outside the Proposed Development and located 948m and 730m from the nearest turbine location respectively.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	The core foraging distance for wintering European golden plover is up to 12 km (Gillings *et al.*, 2007). As the SPA is 2.57 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6).

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. › European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night). <u>Pre-existing survey data</u> › Recorded in all years.		The combined annual collision rate for this species at both northern and Southern Clusters is 1.279 per year during the non-breeding season. In the context of background annual adult mortality of 27% (BTO Birdfacts), this collision rate represents an increase of 0.1% (for both the 2010 SPA reference population and the mean 2008/09 – 2017/18 population at the Southern Roscommon Lakes I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			presence of construction workers.	by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			presence of people during operation.	low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A395] Greenland White-fronted Goose *Anser albifrons flavirostris* (wintering)		<u>SPA population (wintering; national importance)</u> › Reference population at designation (2010): 93 › Mean population 2008/09 - 2017/18: 41 (data for I-WeBS site Southern Roscommon Lakes) <u>Current survey data</u> › Swan and goose feeding distribution surveys: only recorded in one monthly survey (179 in February 2021 with three separate flocks grazing in fields surrounding Lough Croan, which is located beyond the 1 km survey buffer at 1.5 km distance from the Proposed Development).	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Lough Croan and beyond, at least 1 km outside the Proposed Development site.
			Inadvertent destruction of nests during construction.	The SPA is designated for a non-breeding population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and	The core foraging distance for wintering Greenland white-fronted goose is up to 8 km

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Greenland white-fronted goose roost surveys: irregularly recorded at Lough Croan, but with a peak of 267 in January 2021. Birds did not overfly either of the wind farm Clusters, which lie to the south of Lough Croan (i.e. all flights were of birds heading east-west into or away from Lough Croan or north from Lough Croan.) › Northern Cluster flight activity surveys: two flocks in winter 2018/19 (5 & 14); one flock of 72 in winter 2019/20 outside the Proposed Development site leaving Lough Croan heading towards the River Suck Callows; none in winter 2020/21. › Southern flight activity surveys: none in winter 2018/19; none in winter 2019/20; one flock of 50 in winter 2020/21 recorded outside the Proposed Development site. <u>Pre-existing survey data</u>	other infrastructure during operation.	(SNH, 2016). As the SPA is 2.57 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The annual collision rate for this species at the Northern Cluster only (insufficient data were available to model the Southern Cluster) is 0.0054 per year during the non-breeding season. In the context of background annual adult mortality of 28% (BTO Birdfacts), this collision rate represents an increase in 0.2-0.4% (for the 2010 SPA reference population and the mean 2008/09 – 2017/18 population at the Southern Roscommon Lakes I-WeBS site, respectively), assuming all birds recorded are from the SPA population.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Not recorded at the Proposed Development site but recorded in surrounding area (in 2013 and 2016 only, with no identifiable trend in numbers of over the course of the surveys).		An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development). This means that significant disturbance / displacement is unlikely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. A review by Hötker et al. (2006) indicated the disturbance area to wind farms was up to 373 m for geese. Another study by Rees (2012) recorded displacement distances of 30-600 m for geese at terrestrial wind farms. All activity for this SCI species was focused around Lough Croan and beyond (i.e. beyond 1 km from the Proposed Development) and the number of flights through the Proposed Development site was very low. This means that significant displacement (including barrier effects) is unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Based on the assessment presented in Table 6-9 in relation to direct effects on its SCI bird species, there will be no significant effect on the relevant species and therefore no adverse effects to the integrity of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.7.2 Indirect Effects

An assessment is presented in Table 6-10 below in relation to potential indirect effects on the relevant SCIs of the Four Roads Turlough SPA.

Table 6-10: Summary of potential indirect effects on Four Roads Turlough SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[A999] Wetlands and Waterbirds	"To maintain or restore the favourable conservation condition of the wetland habitat at Four Roads Turlough SPA as a resource for the regularly occurring migratory waterbirds that utilise it."	According to the Site Synopsis document for the site, Four Roads Turlough (also known as Cloonlaughnan Turlough) is located 6 km south of Athleague, Co. Roscommon and just over 2 km east of the River Suck. It lies below a low scarp of limestone hills and is an open, shallow basin without permanent standing water which floods regularly and dries out early. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greenland White-fronted Goose and Golden Plover. 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.	Potential surface and ground water quality deterioration resulting from pollution associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this SCI has the potential be a short-term reversible impact on groundwater flows which act as a conduit to downstream habitats. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse.

Wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for Four Roads Turlough SPA (if located within the core foraging range of the SCI species). In the absence of mitigation, wetland habitats within such sites (if hydrologically connected to the Proposed Development)

could be affected by pollution associated with construction, operation and decommissioning of the Proposed Development causing a deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. This could, in turn, adversely affect SCI bird species forming part of the Four Roads Turlough SPA population. Therefore, in the absence of mitigation, significant indirect effects on SCI species are likely.

Based on the assessment presented in Table 6-10 in relation to indirect effects on its SCI wetland habitat, and the paragraph above in relation to indirect effects on its SCI bird species, the potential for effects has been identified; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.8 Potential effects on Lough Ree SPA

An assessment is presented in Table 6-11 in relation to potential direct and indirect effects on the relevant SCI features of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.8.1 Direct Effects

An assessment is presented in Table 6-11 below, in relation to potential direct effects on the relevant SCI bird species of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-11: Summary of potential direct effects on Lough Ree SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A050] Eurasian Wigeon *Mareca penelope* (wintering)	"To maintain or restore the favourable conservation condition of the bird	SPA population (wintering; national importance) › Reference population at designation (1995): 1,475	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
	species listed as Special Conservation Interests for this SPA"	› Mean population 2013/14 - 2017/18: 17 (data for SPA I-WeBS site) <u>Current survey data</u> › Northern Cluster flight activity surveys: one record (as secondary target species) of flock of 40-50 (winter 2019/20). One record (as primary target species) of flock of 35 (winter 2020/21). › Southern Cluster flight activity surveys: two records (as secondary target species) (winter 2019/20), max. flock size 57. Seven records (as primary target species) with combined total of 291 (max. flock size 120) (winter 2020/21), all of which were observed flying over Feacle Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.	infrastructure, including the underground Grid Connection	No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Feacle Turlough, outside the Proposed Development and located 730 m from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	In the absence of specific data for this species the core foraging distance for wintering Eurasian wigeon has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6).

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				The annual collision rate for this species at the Southern Cluster (insufficient data were available to model the Northern Cluster) is 0.794 per year during the non-breeding season. In the context of background annual adult mortality of 47% (BTO Birdfacts), this collision rate represents an increase in 0.1 for the 1995 SPA reference population (comparison with the mean 2013/14 – 2017/18 population at the Lough Ree I-WeBS site is not applicable due to the very low numbers, which either seem likely to represent incomplete count data or indicate that the SPA is no longer important for the species), assuming all birds recorded are from the SPA population An increase in background mortality >1% is considered significant (Percival, 2003). Compared against the 1995 SPA reference population, the increase predicted is considerably less than this, making it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances mean that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances between the closest key wetland sites likely to be used by this species and the low number of flights through the turbine Clusters means that significant

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A052] Eurasian Teal *Anas crecca* (wintering)		<u>SPA population (wintering; national importance)</u> › Reference population at designation (1995): 912 › Mean population 2013/14 - 2017/18: 24[43] (data for SPA I-WeBS site) <u>Current survey data</u> › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys (all records as secondary target species): 3 records of a	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats (wetland habitats) for this SCI species are predicted.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.

[43] *The mean 2013/14 – 2017/18 population at the Lough Ree I-WeBS site is very low in comparison to the reference population at designation (1995), which either seem likely to represent incomplete count data or indicate that the SPA is no longer important for the species,*

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		combined total of 36 birds (winter 2018/19), 2 records of a combined total of 7 birds (breeding season 2019) and 3 records of a combined total of 7 birds (winter 2019/20). <u>Pre-existing survey data</u> › Recorded in all years.	Mortality due to collision with turbine blades and other infrastructure during operation	In the absence of specific data for this species the core foraging distance for wintering Eurasian teal has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has not been undertaken for this species, as the number of flights through the Collision Risk Zone (CRZ) at potential collision heights (PCH) was so low that modelling was not warranted, indicating that collision risk is negligible.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances, mean

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances between wetland habitats that may be used by this species and the low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A053] Mallard *Anas platyrhynchos* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1995): 675 › Mean population 2013/14 - 2017/18: 29[44] (data for SPA I-WeBS site) Current survey data › Northern Cluster flight activity surveys: 2 records (as secondary target species) of a total of 6 birds (winter 2019/20); › Southern Cluster flight activity surveys (all records as secondary target species): 2 records of a combined total of 7 birds (winter 2018/19), 7 records of a combined total of 45 birds (breeding season 2019), 2 records of a combined total of 37 birds (winter 2019/20), 8 records of a combined total of 17	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats (wetland habitats) for this SCI species are predicted.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and although recorded during the breeding season no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	In the absence of specific data for this species the core foraging distance for wintering mallard has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the

[44] *The mean 2013/14 – 2017/18 population at the Lough Ree I-WeBS site is very low in comparison to the reference population at designation (1995), which either seem likely to represent incomplete count data or indicate that the SPA is no longer important for the species,*

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		birds (breeding season 2020), 9 records of a total of 22 birds (winter 2021/21) and 22 records of a combined total of 123 birds (breeding season 2021). <u>Pre-existing survey data</u> › Recorded in winter 2014/15 and 2016/17 only.		precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has not been undertaken for this species, as the number of flights through the Collision Risk Zone (CRZ) at potential collision heights (PCH) was so low that modelling was not warranted, indicating that collision risk is negligible.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances mean that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances between wetland habitats that may be used by this species and the low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A065] Common Scoter *Melanitta nigra* (breeding)		SPA population (breeding; national importance) › Reference population at designation (1995): 35 › Population in 2012: 10 breeding birds (Hunt *et al.*, 2012)	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats. No evidence this SCI species uses ex-situ habitats at the Proposed Development site as

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		Current survey data › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys: 1 record (as secondary target species) of 1 bird (breeding season 2019). Pre-existing survey data › Not recorded in historical surveys.	underground Grid Connection	recorded flying through area only and no suitable breeding habitat is present.
			Inadvertent destruction of nests during construction	The SPA is designated for the breeding population of this SCI species but no breeding birds were recorded during surveys (the single sighting was of a bird commuting through the area) and no suitable breeding habitat is present, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	In the absence of specific data for this species the core foraging distance for breeding common scoter has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has not been undertaken for this species, as the number of flights through the Collision Risk Zone (CRZ) at potential collision heights (PCH) was so low (a single flight across three years of surveys) that

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				modelling was not warranted, indicating that collision risk is negligible.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	No evidence this SCI species breeding or using habitats near the Proposed Development was recorded, with only a single flight was recorded over three years of surveys, rendering potential disturbance impacts highly unlikely. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, owing to the very low number of birds recorded and the lack of suitable habitat for the species. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
[A125] Eurasian Coot *Fulica atra* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1995): 250 › Mean population 2013/14 - 2017/18: 99[45] (data for SPA I-WeBS site) Current survey data › Northern Cluster flight activity surveys: none recorded. › Southern Cluster flight activity surveys (all records as secondary target species): 1 record of 1 bird (breeding season 2020), 1 record of 2 birds (winter 2020/21) and 2 records of a combined total of 6 birds (breeding season 2021).	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats (wetland habitats) for this SCI species are predicted.
			Inadvertent destruction of nests during construction.	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	In the absence of specific data for this species the core foraging distance for wintering Eurasian coot has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from

[45] *The mean 2013/14 – 2017/18 population at the Lough Ree I-WeBS site is very low in comparison to the reference population at designation (1995), which either seem likely to represent incomplete count data or indicate that the SPA is no longer important for the species,*

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		Pre-existing survey data › Recorded during winter 2014/15 only.		the SPA population are potentially exposed to collision mortality. Collision risk modelling has not been undertaken for this species, as the number of flights through the Collision Risk Zone (CRZ) at potential collision heights (PCH) was so low that modelling was not warranted, indicating that collision risk is negligible.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	The closest wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances mean that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances from potentially suitable wetland habitats and the low number of flights through the turbine Clusters mean that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A140] European Golden Plover *Pluvialis apricaria* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1995): 2,035 › Mean population 2013/14 - 2017/18: 1,127 (data for SPA I-WeBS site) Current survey data	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Thomas Street Turlough and Feacle Turlough, outside the Proposed

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		› Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter 2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. › European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were		Development and located 948m and 720m respectively from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for the winter population of the SCI and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	The core foraging distance for wintering European golden plover is up to 12 km (Gillings *et al.*, 2007). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters is 1.279 per year during the non-breeding season.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night). Pre-existing survey data › Recorded in all years.		In the context of background annual adult mortality of 27% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.4% (for the 1996 SPA reference population and the mean 2013/14 – 2017/18 population at the Lough Ree I-WeBS site, respectively), assuming all birds recorded are from the SPA population An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
				No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A142] Northern Lapwing *Vanellus vanellus* (wintering)		<u>SPA population (wintering; national importance)</u> › Reference population at designation (1995): 3,870 › Mean population 2013/14 - 2017/18: 608 (data for SPA I-WeBS site) <u>Current survey data</u> › Northern Cluster flight activity surveys: 11 flights with combined total of 126 (max. flock size of 26) (winter 2018/19); 1 flock of 10 birds (winter 2019/20); 3 flights with combined total of 60 (max. flock size 40) (winter 2020/21). › Southern Cluster flight activity surveys: 6 flights with a combined total of 69 birds (max. flock size 35) (winter 2019/20); 8 flights with a combined total of 313 (max.	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Feacle Turlough, outside the Proposed Development and located 730 m from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for the non-breeding population of the SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	The core foraging distance for wintering northern lapwing is up to 12 km (Gillings *et al.*, 2007). As the SPA is 8.49 km from the wind farm element of the Proposed Development, which is less than the core foraging distance,

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
		flock size 50) (winter 2020/21); combined total of 60 birds (max. flock size 34) (primary target species data) breeding season 2021. Most recorded activity focussed around Feacle Lough Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.		birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters is 1.66 per year during the non-breeding season. In the context of background annual adult mortality of 30% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.9% (for the 1995 SPA reference population and the mean 2013/14 – 2017/18 population based on I-WeBS data, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Impact Assessment
			may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Based on the assessment presented in Table 6-11 in relation to direct effects on its SCI bird species, there will be no significant effect on the relevant species and therefore no adverse effects to the integrity of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.8.2 Indirect Effects

Wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for Lough Ree SPA (if located within the core foraging range of the SCI species). In the absence of mitigation, wetland habitats within such sites (if hydrologically connected to the Proposed Development) could be affected by pollution associated with construction, operation and decommissioning of the Proposed Development causing a deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. This could, in turn, adversely affect SCI bird species forming part of the Lough Ree SPA population. Therefore, in the absence of mitigation, significant indirect effects on SCI species are likely.

Based on the assessment presented in the paragraph above in relation to indirect effects on its SCI bird species, the potential for effects has been identified; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.

6.1.9 Potential effects on Middle Shannon Callows SPA

An assessment is presented in Table 6-12 and Table 6-13 and respectively in relation to potential for effects on the relevant SCI bird species of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.9.1 Direct Effects

An assessment is presented in Table 6-12, below, in relation to potential direct effects on the relevant SCI bird species of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

Table 6-12: Summary of potential direct effects on Middle Shannon Callows SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
[A050] Eurasian Wigeon *Mareca penelope* (wintering)	"To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation	SPA population (wintering; national importance) › Reference population at designation (1996): 2,972 › Mean population 2010/11 - 2017/18: 405 (data for I-WeBS site Shannon Callows) Current survey data	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Feacle Turlough, outside the Proposed Development and located 730 m from the nearest turbine location.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
	Interests for this SPA"	› Northern Cluster flight activity surveys: one record (as secondary target species) of flock of 40-50 (winter 2019/20). One record (as primary target species) of flock of 35 (winter 2020/21). › Southern Cluster flight activity surveys: two records (as secondary target species) (winter 2019/20), max. flock size 57. Seven records (as primary target species) with combined total of 291 (max. flock size 120) (winter 2020/21), all of which were observed flying over Feacle Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.	Inadvertent destruction of nests during construction	The SPA is designated for the wintering population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation	In the absence of specific data for this species the core foraging distance for wintering Eurasian wigeon has been assumed to be up to 20 km as a precaution (SNH, 2016). As the SPA is 11.66 km from the Wind Farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The annual collision rate for this species at the Southern Cluster (insufficient data were available to model the Northern Cluster) is 0.794 per year during the non-breeding season.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
				In the context of background annual adult mortality of 47% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.4% (for the 1996 SPA reference population and mean 2010/11 – 2017/18 population at the Shannon Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is considerably less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances mean that no significant displacement impacts are likely to occur.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
				No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The intervening distances from potentially suitable wetland habitats and the low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
[A140] European Golden Plover *Pluvialis apricaria* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1996): 4,254 › Mean population 2010/11 - 2017/18: 576 (data for I-WeBS site Shannon Callows) Current survey data › Northern Cluster flight activity surveys: 2 flights (max. flock size 49) (winter 2018/19); 5 flights with a combined total of 140 (max. flock size 50) (winter 2019/20); 4 flights with a combined total of 107 (winter 2020/21). Most of the observations were associated with Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location. › Southern Cluster flight activity surveys: 2 flights (combined total of 11) (winter 2018/19); 3 flights (combined total of 36) (winter	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Thomas Street Turlough and Feacle Turlough, outside the Proposed Development site and located 948m and 720m respectively from the nearest turbine location.
			Inadvertent destruction of nests during construction	The SPA is designated for the wintering population of the SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	The core foraging distance for wintering European golden plover is up to 12 km (Gillings *et al.*, 2007). As the SPA is 11.66 km from the wind farm element of the Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
		2019/20); 5 flights with a combined total of 122 (max. total of 40) (winter 2020/21). The majority of the observations were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. › European golden plover nocturnal foraging surveys: max. of 5 birds at the Northern Cluster (surveys were not carried out at the Southern Cluster as the habitats were judged to be less suitable for golden plover than those at the Northern Cluster and the relatively rough topography and terrain present at the Southern Cluster was considered a health and safety risk to surveyors working in such terrain at night). <u>Pre-existing survey data</u> › Recorded in all years.		Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters is 1.279 per year during the non-breeding season. In the context of background annual adult mortality of 27% (BTO Birdfacts), this collision rate represents an increase in 0.1-0.8% (for the 1996 SPA reference population and the mean 2010/11 – 2017/18 population at the Shannon Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers.	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are likely along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
			may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	and human presence is predicted to be very low overall. The intervening distances from wetland sites used by this species, the abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A142] Northern Lapwing *Vanellus vanellus* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1996): 11,578 › Mean population 2010/11 - 2017/18: 597 (data for I-WeBS site Shannon Callows) Current survey data	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI are predicted, as activity was concentrated at Feacle Turlough, outside the Proposed Development and located 730 m from the nearest turbine location.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
		› Northern Cluster flight activity surveys: 11 flights with combined total of 126 (max. flock size of 26) (winter 2018/19); 1 flock of 10 birds (winter 2019/20); 3 flights with combined total of 60 (max. flock size 40) (winter 2020/21). › Southern Cluster flight activity surveys: 6 flights with a combined total of 69 birds (max. flock size 35) (winter 2019/20); 8 flights with a combined total of 313 (max. flock size 50) (winter 2020/21); combined total of 60 birds (max. flock size 34) (primary target species data) breeding season 2021. Most recorded activity focussed around Feacle Lough Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded in all years.	Inadvertent destruction of nests during construction	The SPA is designated for the wintering population of this SCI species and no breeding birds were recorded during surveys, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	The core foraging distance for wintering northern lapwing is up to 12 km (Gillings *et al.*, 2007). As the SPA is 11.66 km from the wind farm element Proposed Development, which is less than the core foraging distance, birds from the SPA population are potentially exposed to collision mortality. Collision risk modelling has been undertaken for this species. Full details of the collision risk modelling results can be seen in the appended Collision Risk Modelling Report (Appendix 6). The combined annual collision rate for this species at both northern and Southern Clusters is 1.66 per year during the non-breeding season. In the context of background annual adult mortality of 30% (BTO Birdfacts), this collision rate represents an increase in <0.1-0.9% (for the 1996 SPA reference population and the mean

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
				2010/11 – 2017/18 population at the River Suck Callows I-WeBS site, respectively), assuming all birds recorded are from the SPA population. An increase in background mortality >1% is considered significant (Percival, 2003). As the increase predicted is less than this, it is unlikely the impact of collision with turbine blades will have a significant effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur.
			Disturbance / displacement to birds due to operation of	Disturbance effects during the operational phase are not likely to be significant, as birds

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
			wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	may become habituated to turbine presence and human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are highly unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.
[A179] Black-headed Gull *Chroicocephalus ridibundus* (wintering)		SPA population (wintering; national importance) › Reference population at designation (1996): 1,061 › Mean population 2010/11 - 2017/18: 292 (data for I-WeBS site Shannon Callows) Current survey data	Habitat loss / damage (permanent and temporary) of 29.6 ha of primarily agricultural habitats due to construction of wind farm infrastructure, including the underground Grid Connection.	The Proposed Development is located entirely outside of the SPA, precluding any direct impacts to habitats within the SPA. No significant loss of important ex-situ habitats for this SCI species are predicted, as activity was concentrated at Feacle Turlough and Thomas Street Turlough, outside the Proposed Development site and located 730 m and 948 m respectively from the nearest turbine location.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
		› Northern Cluster flight activity surveys: combined total of 24 birds (secondary species data), winter 2018/19; 2 birds (secondary species data) breeding season 2019; combined total of 1,956 (max. flock size 500, with the vast majority of sightings at Thomas Street Turlough, which is located 948 m from the nearest proposed turbine location) (secondary species data), winter 2019/20; 13 flights, combined total of 41 (max. flock size 10) (primary target species data) breeding season 2020; combined total of 334 (max. flock size 60) (secondary species data) winter 2020/21; combined total of 51 birds (max. flock size 12) (primary target species data) breeding season 2021. › Southern Cluster flight activity surveys: combined total of 602 (max. flock 150) (secondary species data), winter 2018/19; combined total of 21 (max. of 2 birds) (secondary species data), breeding	Inadvertent destruction of nests during construction	The SPA is designated for the wintering population of the SCI species and although birds were recorded during the breeding season during surveys there was no evidence of nesting, precluding any direct impacts on nesting birds.
			Mortality due to collision with turbine blades and other infrastructure during operation.	In the absence of specific data for this species the core foraging distance for wintering black-headed gull has been assumed to be up to 20 km (SNH, 2016) as a precaution. As the SPA is 11.66 km from the wind farm element of the Proposed Development, which is less than the precautionary core foraging distance, birds from the SPA population are potentially exposed to collision mortality. The annual collision rate for this species could only be calculated at the Northern Cluster in the breeding season, as insufficient data for the non-breeding season were available. The majority of non-breeding season flights were recorded outside the Collision Risk Zone (CRZ), with flocks located at either Thomas Street Turlough, Feacle Turlough or in flooded

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
		season 2019; combined total of 339 (max. of 42 birds) (secondary species data), winter 2019-20; 19 flights, combined total of 44 (max. flock size 8), (primary target species data) breeding season 2020; combined total of 312 (max. flock size 60) (secondary species data) winter 2020/21; combined total of 97 birds (max. flock size 8) (primary target species data) breeding season 2021. The vast majority of sightings were associated with Feacle Turlough, which is located 730 m from the nearest proposed turbine location. <u>Pre-existing survey data</u> › Recorded during winter 2014/15 and 2016/18 only.		fields away from proposed turbine locations. Any flights within the CRZ were typically below potential collision heights (PCH). Therefore, the impact of collision with turbine blades is predicted to have a negligible effect on the SPA population for this SCI species.
			Disturbance / displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers.	None of the habitats predicted to be lost due to the construction of the Proposed Development are particularly important for this SCI species. The closest key wetland sites likely to be used by this species are located 730 m and 948 m from the nearest proposed turbine locations at Feacle Turlough and Thomas Street Turlough, respectively. These intervening distances and the abundance of widely available alternative foraging habitats for this SCI species in the wider landscape (wetlands and agricultural fields), means that no significant displacement impacts are likely to occur. No significant disturbance/displacement effects are predicted along the Grid Connection route, with underground cables buried within or adjacent to a busy, existing regional road. It is unlikely any disturbance/displacement will be

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential impacts in relation to Proposed Development	Likelihood of significant potential unmitigated impact
				significantly greater than that from typical traffic levels.
			Disturbance / displacement to birds due to operation of wind turbines (including barrier effects where birds may be forced to fly over or around turbines, resulting in greater energy expenditure), vehicular traffic and the presence of people during operation	Disturbance effects during the operational phase are not likely to be significant, as birds may become habituated to turbine presence and human presence is predicted to be very low overall. The abundance of alternative foraging habitats in the surrounding landscape and the relatively low number of flights through the turbine Clusters means that significant displacement impacts (including barrier effects) are unlikely to occur. No operational effects are predicted for the Grid Connection, which will be underground and located beneath or adjacent to a regional road.

Based on the assessment presented in Table 6-12 in relation to direct effects on its SCI bird species, there will be no significant effect on the relevant species and therefore no adverse effects to the integrity of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

6.1.9.2 Indirect Effects

An assessment is presented in Table 6-13 below in relation to potential indirect effects on the relevant SCIs of the Middle Shannon Callows SPA.

Table 6-13: Summary of potential indirect effects on Middle Shannon Callows SPA

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
[A999] Wetlands and Waterbirds	"To maintain or restore the favourable conservation condition of the wetland habitat at Middle Shannon Callows SPA as a resource for the	According to the Site Synopsis document for the site, 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,	Potential surface and ground water quality deterioration resulting from pollution associated with the construction, operation and decommissioning of the proposed project.	In the absence of mitigation, the indirect effect of water pollution on this SCI habitat has the potential be a short-term reversible impact on water quality. The magnitude of any such impact is likely to be at worst moderate, given that all major infrastructure such as turbine bases, site compound etc. are located away from any significant watercourse.

Special Conservation Interests for which European Site has been designated	Conservation Objectives	Summary of baseline for Special Conservation Interest	Potential indirect impacts in relation to Proposed Development	Impact Assessment
	regularly-occurring migratory waterbirds that utilise it."	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.		

Wetland sites designated for their non-avian interest, including SACs, could potentially support birds forming part of the population for Middle Shannon Callows SPA (if located within the core foraging range of the SCI species). In the absence of mitigation, wetland habitats within such sites (if hydrologically connected to the Proposed

Development) could be affected by pollution associated with construction, operation and decommissioning of the Proposed Development causing a deterioration in water quality and alteration of local hydrology via groundwater and surface water pathways. This could, in turn, adversely affect SCI bird species forming part of the Middle Shannon Callows SPA population. Therefore, in the absence of mitigation, significant indirect effects on SCI species are likely.

Based on the assessment presented in

Table 6-13 **in relation to indirect effects on its SCI wetland habitat, and the paragraph above in relation to indirect effects on its SCI bird species, the potential for effects has been identified; therefore in the absence of mitigation there exists the potential for adverse effects to the integrity of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development. Mitigation to be implemented to ensure that no adverse impacts occur as a result of the Proposed Development is set out in Section 6.2.**

6.2 Mitigation of Potential Impacts

Mitigation measures to be implemented to eliminate the potential for adverse impacts on European sites or on wetland features lying outside SPAs but which may be used by SPA birds , as identified in Section 6.1 are set out below. A summary of potential impacts identified in the absence of mitigation and the mitigation that will be implemented to address these are summarised in Table 6-16 at the end of this section.

6.2.1 Deterioration of Water Quality

A potantial pathway for indirect effect on the ground/surface water dependent Qualifying Interests of Ballymona Bog and Corkhip Lough SAC, Four Roads Turlough SAC and River Shannon Callows SAC was identified in the form or surface and ground water deterioration resulting from pollution associated with the construction , operation and decommissioning of the Proposed Development.

A potantial pathway for indirect effect on the supporting wetland habitat for SCI species associated with River Suck callows SPA, Four Roads SPA and Middle Shannon Callowis SPA was identified in the form or surface and ground water deterioration resulting from pollution associated with the construction, operation and decommissioning of the Proposed Development.

Mitigation measures in relation to potential deterioration in water quality are fully set out in the sections below.

6.2.1.1 Mitigation - Deterioration of Water Quality

Apart from the upgrade of existing watercourse crossings associated with the Grid Connection route, and which are described in Section 9.5.2 of the Hydrological Assessment included as Appendix 3, all other areas of the Proposed Development infrastructure are away from areas on the site that have been determined to be hydrologically sensitive. The footprint of the Proposed Development has been specifically designed to avoid surface water bodies within the study area (i.e. all significant infrastructure has been located 50 metres from EPA mapped watercourses).

A general description of the various construction methods employed at watercourse crossings are described in, see Section 3.3.10 of this NIS and in Chapter 9 – Hydrology and Hydrogeology of the EIAR (included as Appendix 3 of this NIS).

From a precautionary perspective, there is potential for the construction activity to result in the runoff of silt, nutrients and other pollutants such as hydrocarbons and cementitious material into ground and surface watercourses. This could result from chemical spills during site works, works movement of excavated materials or the use of concrete and other construction materials. The proposed Grid Connection route will cross watercourses that include the Ballyglass and Cross Rivers with connectivity to nearby EU sites.

A potential pathway for impact in the form of deterioration of water quality during construction, operation and decommissioning was identified, with respect to the QIs/SCIs identified in Section 2 of this NIS, in the absence of mitigation:

- Ballynamona Bog And Corkip Lough SAC
- Four Roads Turlough SAC
- River Shannon Callows SAC
- River Suck Callows SPA
- Four Roads Turlough SPA
- Middle Shannon Callows SPA

In addition, a potential pathway for impact on SCIs in the form of deterioration in water quality during construction, operation and decommissioning was identified in Section 2 for wetland sites designated for their non-avian interest. The relevant SPAs include:

- Lough Croan Turlough SPA
- Lough Ree SPA
- River Suck Callows SPA
- Middle Shannon Callows SPA
- Four Roads Turlough SPA

The below subsections describe the mitigation measures incorporated into the Proposed Development for the protection of water quality during the construction, operation and decommissioning phases. These are in addition to the drainage and construction methodologies already described in Section 3.4 and 3.5.

6.2.1.1.1 *Mitigation by Design*

The design of the Proposed Development is provided in the detailed design drawings (see Appendix 6). The CEMP (Appendix 2 of this NIS) sets out clearly how the Proposed Development, including the underground Grid Connection route, has been designed and will be operated in accordance with best industry practice to avoid any significant effects outside the site, including the prevention of impacts on watercourses. This design includes suitable precautionary mitigation to make certain that the Proposed Development will not adversely affect the integrity of European sites.

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

- The Proposed Development has been designed so that all infrastructure is located over 50 metres from watercourses significant watercourses i.e. those mapped by the EPA46.
- The Wind Farm component of the Proposed Development will not require the crossing of any existing streams or watercourses. However, a total of 5 no. existing crossings will be crossed along the R363 Regional Road to cater for the proposed underground IPP cable route and external Grid Connection towards the existing Athlone 110 kV substation. However, no instream works are not required at any watercourse crossing along the proposed underground IPP cable route or Grid Connection route and a suite of measures are in place to avoid any adverse effects on watercourses. These measures are described in full in the hydrological assessment report that is included in full as Appendix 3 of this NIS. They are also described in Section 3 of this NIS.
- New site access roads have been designed to minimise excavation arisings (see detailed design drawings in Appendix 7 of this NIS).
- The development has been designed to maintain a drainage neutral situation to avoid drainage related impacts (See hydrological assessment, Appendix 3 of this NIS).
- Hard standing areas have been designed to the minimum size necessary to accommodate the turbine model specifications, see Section 4.3.1.4, Chapter 4 of the accompanying EIAR. As above.

6.2.1.1.2 *Construction Phase Mitigation*

Mitigation measures have been incorporated into the Proposed Development for the prevention of water pollution. The Proposed Development includes a detailed drainage plan (see the detailed design drawing, 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

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

adequately treat any water that may arise and to ensure that the hydrological function of the watercourses on the site and in the wider catchment are not affected by the proposed works. This philosophy including all associated mitigation measures to protect local surface water quality are fully described in the Construction and Environmental Management Plan (CEMP) and Chapter 9 'Water' of the EIAR, included as Appendix 2 and Appendix 3 respectively.

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

All detailed mitigation measures for the protection of water quality are fully described below and in the CEMP (in Appendix 2 of this NIS) and Sections 9.5.2 Chapter 9 'Water' of the EIAR (provided here in Appendix 3 of the NIS). As described in Chapter 9 'Water' the following watercourses have been identified as the main sensitive aquatic receptors, that also provide connectivity to downstream EU designated sites:

- Ballyglass River,
- Cross River,

The following subsections describe the mitigation measures proposed for the construction phase of the Proposed Development.

6.2.1.1.3 *Grid Connection Watercourse Crossings*

The Wind Farm component of the Proposed Development will not require the crossing of any existing streams or watercourses. However, a total of 5 no. existing crossings will be crossed along the R363 Regional Road to cater for the proposed underground IPP cable route and external Grid Connection towards the existing Athlone 110 kV substation. The locations of the watercourse crossings are shown in the detailed layout drawings included in Appendix 7 of this NIS. The watercourse crossing methodologies for the provision of the underground Grid Connection component of the Proposed Development at these locations is set out below with the most appropriated option being selected for each crossing. Instream works are not required at any watercourse crossing along the proposed underground IPP cable route or grid connection route.

Inland Fisheries Ireland have published guidelines relating to 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.

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

Crossing Using Standard Trefoil Formation – Option 1

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed, the standard ESB approved trefoil 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.

Flatbed Formation over Bridges/Culverts – Option 2

Where cable ducts are to be installed over an existing bridge/culvert crossing where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much

shallower trench the depth of which will be determined by the location of the top of the culvert or the depth of excavatable material over a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge or culvert has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per EirGrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to raise the pavement level locally to fully cover the ducts. The increased road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench.

Horizontal Directional Drilling – Option 3

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5mm wide, 2.5m long and 2.0m 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 will 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 will 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, as listed below, 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 area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids shall 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.

All water protection measures prescribed in the hydrological assessment, Appendix 3 of this NIS, for the protection of water quality will be implemented in full.

6.2.1.1.4 Pre-Construction Drainage

There is an existing drainage network across the site with runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre-construction phase. However, prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage. It is proposed to complete these inspections on a catchment by catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.

6.2.1.1.5 Construction Phase Drainage Management

The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and stilling ponds constructed to eliminate any suspended solids within surface water running off the site. The following best practice drainage measures have been incorporated into the Proposed Development for the protection of surface water quality, as fully described in Section 3.2.4.2 of the CEMP, see Appendix 2 of this NIS:

- Interceptor drains will be maintained 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/roadside drains will be maintained to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to stilling ponds for sediment settling;
- Check dams will be maintained at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Stilling ponds/settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. The stilling ponds will be sized according to the size of the area they will be receiving water from but will be sufficiently large to accommodate peak flows storm events. Inspection and maintenance of all settlement ponds will be ongoing through the construction period.

Best practice and practical experience on other similar projects suggests that, in addition to the drainage plans that are included in the EIAR, there are additional site-based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these are outlined within Section 4 of the CEMP (see Appendix 2).

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined in Section 4 of the CEMP and to ensure protection of all watercourses.

6.2.1.1.6 Operational Phase Drainage

The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work as described above and as shown in the detailed design drawings for the Proposed Development (see Appendix 7).

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.

6.2.1.1.7 Preparative Site Drainage Management

The materials and equipment necessary to implement the drainage measures outlined above will be brought on-site in advance of any works commencing.

An adequate quantity of straw bales, clean stone, terram, wooden stakes, etc. will be kept on site at all times to implement the drainage mitigation measures as necessary. The drainage measures outlined below will be installed prior to, or at the same time as the works they are intended to drain.

6.2.1.1.8 Pre-emptive Site Drainage Management

The works programme for the groundworks element of the construction phase will take account of weather forecasts and predicted rainfall in particular. The site Construction Manager/Site Supervisor is responsible for making the decision to postpone or abandon works. 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.

6.2.1.1.9 Reactive Site Drainage Management

The final drainage design prepared for the site has provided for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. 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.

6.2.1.1.10 Cable Trench Drainage

Cable trenches are typically 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 transported to one of the on-site overburden storage areas, borrow pits or used for landscaping and reinstatements of other areas elsewhere on site. Silt bags will be used where small to medium volumes of water need to be pumped from excavations.

On steeper slopes, silt fences 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.

6.2.1.1.11 *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 Construction and Environmental Management Plan (CEMP) (see Appendix 3 of this NIS) provides measures to avoid impacts on the wider environment as a result of pollution.

Refuelling, Fuel and Hazardous Materials Storage

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling should occur at a controlled fuelling station;
- On-site refuelling will take place using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site and will be towed around the site by a 4x4 vehicle 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 dumpers, excavators, etc. that will be used during construction. The 4x4 vehicle 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 and fuel absorbent mats will be used during all refuelling operations;
- Fuel 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. The bunded area will be roofed to prevent the ingress of rainwater and fitted with a storm drainage system and an appropriate oil interceptor;
- The electrical substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- 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 Environmental Management Plan.
- Spill kits will be available to deal with any accidental spillage in and outside the refuelling area.

The emergency response plan for the construction phase has been provided with this CEMP (Section 5) which sets out the procedure for dealing with accidental spillages will be maintained throughout the construction phase of the Proposed Development.

6.2.1.1.12 *Cement Based Products Control Measures*

The following mitigation measures are proposed to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on site;

- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute need 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;
- Use weather forecasting to plan dry days for pouring concrete;
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event;
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, typically built using straw bales and lined with an impermeable membrane. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is taken 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.

The 50 m wide river buffer zone and 20 m existing artificial drainage buffer will be emplaced for the duration of the construction phase. No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement-based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain discharge outside the 50 m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct pollution of surface waters by any pollutants, or by pollutants entrained in surface water run-off.

6.2.1.1.13 *Monitoring*

As described in Section 4.2.2 of the CEMP, see main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Site ECoW, and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

6.2.1.1.14 *Spill Control Measures*

Every effort will be made to prevent an environmental incident during the construction and operational phase of the project. Oil/ fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.

- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Roscommon County Council, National Parks and Wildlife Service (NPWS), Inland Fisheries Ireland (IFI), Department of Communications, Climate Action and Environment (DCCAE) and Department of Housing, Planning and Local Government (DHPLG) if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site e.g. Special Protection Area (SPA) or Special Area of Conservation (SAC), the ECoW will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

6.2.1.1.15 *Operation Phase Mitigation*

The operational phase drainage measures incorporated into the Proposed Development design will remain in place for the duration of the project to avoid any potential operational phase run-off from hard stands. Details of all proposed drainage measures incorporated into the Proposed Development are fully described in Section 6.2.2, as well as in Section 9.5.3, Chapter 9 '*Water*' (Appendix 2) and Section 3.2.4 of the CEMP (see Appendix 3 of this NIS).

6.2.1.1.16 *Decommissioning Phase Mitigation*

The wind turbines proposed as part of the Proposed Development 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 Proposed Development may be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid and will form a permanent part of the electricity grid.

Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. The turbines will be disassembled with the same model of cranes that were used for their erection. The turbine will 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.

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

Site roadways will be in use for purposes other than the operation of the development by the time the decommissioning of the Proposed Development 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. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required.

The electrical cabling connecting the turbines and the connection to the substation will be removed from the underground cable ducting at the end of the useful life of the Proposed Development. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the accompanying EIAR and within this NIS.

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 measures described in Section 5.2.2.2.2 of this NIS and associated Appendices will be implemented in full during decommissioning for the protection of water quality and downstream designated sites.

6.2.2 Potential Effects on Groundwater Flows and Levels due to alteration of recharge (including activation of potential karst)

6.2.2.1 Mitigation by Avoidance - Groundwater Flows:

The construction activities associated with the Proposed Development have the potential to impact groundwater flows within the Northern and Southern Clusters, if a particular pathway *e.g.* karst conduit, existed near the development, however based on all the available site investigation data no pathways or evidence of potential pathways have been identified. The identification and avoidance of any potential karst features has been a key aim of the intrusive and extrusive site investigations and is considered to be the most rational method of mitigating against effecting flow paths, by avoiding any potential karst areas.

The site data outlined within Section 9.3.7.3 of Appendix 3 provides sufficient scientific data to say, with a high degree of certainty, that the construction activities associated with the Proposed Development, will not interact with or alter the existing groundwater recharge, and underlying groundwater flow, regimes.

All proposed wind farm infrastructure will be installed above recorded groundwater levels, therefore there is no potential for wind farm infrastructure to block or alter underlying groundwater flow regimes.

6.2.2.2 Mitigation by Design - Groundwater Levels:

As mentioned above, the critical driver of groundwater levels and the potential to affect them is through groundwater recharge. The drainage design of the Proposed Development has been designed to mimic the existing hydrological regime within the site, whereby surface water pathways are generally short and rainfall readily percolates to ground. The drainage design incorporates check dams to reduce velocities, two chamber settlement ponds with baffle plates and over topping weirs and outflow from the drains being dispersed over a wide area of vegetation.

The net effect of the drainage design will be that all rainfall falling within the application site (Northern and Southern Clusters) will remain on the site and infiltrate to ground and will not exit the site as runoff to surface watercourses.

6.2.3 Dust Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. soil, sand, peat, etc. and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered and dampened down with water taken form onsite stilling ponds, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the ECoW for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 20 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.

6.2.4 Mitigation of Disturbance and Displacement of Otter

6.2.4.1 Best Practice Preventive Measures

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

Turbine locations are all located over 50 metres from EPA mapped watercourses (see Figure 3-2, and Figure 2.3 of Appendix 1). A total of 5 no. existing crossings will be crossed along the R363 Regional Road to cater for the proposed underground IPP cable route and external Grid Connection towards the existing Athlone 110 kV substation, for which no instream works are required. Therefore, there is no potential for the Proposed Development to result in any barrier to the movement of otter.

6.2.4.2 Pre-Construction Otter Survey

From a highly precautionary perspective, prior to any works being carried out, a pre-construction Otter survey will be undertaken by a qualified ecologist to ensure that Otter has not taken up residence within

or close to the proposed works area. Should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006).

Table 6-14: Summary of likely impacts and mitigation to be implemented

Impact requiring mitigation (as identified in Section 6.1)	European Sites on which potential for impact exists	Mitigation to Address Impact	Likely to be a residual Impact? (Yes/No) (See Section 7 for full Assessment)
Deterioration in water quality on groundwater dependant habitats resulting from pollution	› Ballynamona Bog and Corkip Lough SAC › Four Roads Turlough SAC › Lough Croan Turlough SPA(in relation to possible use of wetland habitats outside the SPA by SCI bird species) › Four Roads Turlough SPA › Lough Ree SPA (in relation to possible use of wetland habitats outside the SPA by SCI bird species) › Middle Shannon Callows SPA › River Suck Callows SPA (in relation to possible use of wetland habitats outside the SPA by SCI bird species)	A full suite of bespoke mitigation measures have been designed to ensure that there is no adverse impacts on groundwater quality associated with the Proposed Development. These mitigation measures are described in detail in Section 6.2.1 above.	No
Deterioration in surface quality resulting from pollution	› River Shannon Callows SAC › River Suck Callows SPA › Middle Shannon Callows SPA	A full suite of bespoke mitigation measures have been designed to ensure that there is no adverse impacts on water quality associated with the Proposed Development.	No

Impact requiring mitigation (as identified in Section 6.1)	European Sites on which potential for impact exists	Mitigation to Address Impact	Likely to be a residual Impact? (Yes/No) (See Section 7 for full Assessment)
	› Lough Croan Turlough SPA (in relation to possible use of wetland habitats outside the SPA by SCI bird species) › Four Roads Turlough SPA (in relation to possible use of wetland habitats outside the SPA by SCI bird species) › Lough Ree SPA (in relation to possible use of wetland habitats outside the SPA by SCI bird species)	These mitigation measures are described in detail in Section 6.2.1 above.	
Dust contamination of terrestrial habitat	› Killeglan Grassland SAC	Proposed dust control measures: › Any site roads with the potential to give rise to dust will be regularly watered and dampened down with water taken form onsite stilling ponds, as appropriate, during dry and/or windy conditions; › The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the ECoW for cleanliness, and cleaned as necessary; › Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;	No

Impact requiring mitigation (as identified in Section 6.1)	European Sites on which potential for impact exists	Mitigation to Address Impact	Likely to be a residual Impact? (Yes/No) (See Section 7 for full Assessment)
		› Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; › Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions; › The transport of soils or other material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles where necessary; › All construction related traffic will have speed restrictions on un-surfaced roads to 20 kph; › Daily inspection of construction sites to examine dust measures and their effectiveness. › When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and, › All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.	
Alteration of hydrological regime of turlough habitat	› Ballynamona Bog and Corkip Lough SAC › Four Roads Turlough SAC › Four Roads Turlough SPA	A full suite of bespoke mitigation measures in relation to drainage measures have been designed to ensure that there is no adverse impacts on groundwater regime associated with the Proposed Development. These mitigation measures are described in Sections 6.2.1.1.4 – 6.2.1.1.10	No
Potential disturbance to otter resulting from works in proximity to	River Shannon Callows	A pre-construction Otter survey will be undertaken by a qualified ecologist to ensure that Otter has not taken up residence within or close to the proposed works area in the intervening period. Should any holt be	No

Impact requiring mitigation (as identified in Section 6.1)	European Sites on which potential for impact exists	Mitigation to Address Impact	Likely to be a residual Impact? (Yes/No) (See Section 7 for full Assessment)
watercourses along the Grid Connection route		encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006). A derogation licence from NPWS would be required for any works judged likely to cause any disturbance to otter.	

7. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

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

7.1 Ballynamona Bog And Corkip Lough SAC

As described in Section 6.1 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 release of pollutants including suspended solids and hydrocarbons, potentially affecting the following groundwater dependant habitats and supporting habitats for aquatic fauna:

- [3180] Turloughs

Mitigation measures have been incorporated into the Proposed Development for the avoidance of impact as fully described in Section 6.2 of this NIS. The potential for residual adverse effect on these QI habitats and species has therefore been assessed in the following subsections.

7.1.1 Turloughs [3180]

An assessment of the Proposed Development against the nominated attributes and targets for this habitat, as per the Site-Specific Conservation Objectives (NPWS, 2016), is provided in Table 6-1.

Table 7-1 Targets and attributes associated with nominated site-specific conservation objectives for Turloughs

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 prevented. No impacts have been identified in relation to alteration in community, extent, structure or distribution as a result of the proposals and no deterioration in the condition of terrestrial habitat due to the proposed works. The only identified pathway for effect is via indirect groundwater 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 project CEMP (Appendix 2 of this NIS) and the detaile hydrological assessment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes to groundwater flow during construction, operation and
Habitat distribution	No decline, subject to natural processes	
Hydrological regime: flood duration, frequency, area, depth; permanently flooded area	Maintain/restore appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	
Soil type: area	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	
Soil nutrient status: nitrogen and phosphorus	Maintain/restore nutrient status appropriate to soil types	
Physical structure: bare ground	Maintain sufficient wet bare ground, as appropriate	

Chemical processes: calcium carbonate deposition and concentration	Maintain calcium carbonate deposition rate and/or soil concentration	decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI habitats of the SAC occur.
Water quality: nutrients; colour; phytoplankton; epiphyton	Maintain appropriate water quality to support the natural structure and functioning of the habitat	
Active peat formation	Restore active peat formation, where appropriate	
Vegetation composition: area of vegetation communities	Maintain area of sensitive and high conservation value vegetation communities/units	
Vegetation composition: vegetation zonation	Maintain vegetation zonation/mosaic characteristic of the site	
Vegetation structure: sward height	Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	
Typical species: terrestrial, wetland and aquatic plants, invertebrates and birds	Maintain typical species	
Fringing habitats: area	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	
Vegetation structure: turlough woodland	Maintain appropriate turlough woodland diversity and structure	

7.1.1.1 Determination on potential for adverse effects

Based on the above, following the implementation of mitigation measures that are outlined in Section 6.2 of this report it can be concluded, in view of the best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Turloughs [3180] associated with Ballynamona Bog and Corkip Lough SAC.

7.2 Killeglan Grassland SAC

As described in Section 6.1 of this NIS, the proposed works associated with the construction, operation and decommissioning phases of the Proposed Development have the potential to cause deterioration of QI habitat resulting from project emissions during the construction, operation and decommission phases:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) [6210]

Mitigation measures have been incorporated into the Proposed Development for the avoidance of impact as fully described in Section 6.2 of this NIS. The potential for residual adverse effect on these QI habitats and species has therefore been assessed in the following subsections.

7.2.1 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) [6210]

An assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 7.2.

*Table 7-2: Targets and attributes associated with the site-specific conservation objectives for Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) [6210]*

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. There will be no alteration in community, extent, structure or distribution as a result of the proposal and no deterioration in the condition of the terrestrial habitat due to the proposed works. The only identified potential pathway for effect is via spread of dust emissions produced during the construction, operational and decommissioning phases of the Proposed Development. This has been considered in the design of the Proposed Development and a range of measures (outlined in Sections 3 and 6.2 of this NIS, and the project CEMP (Appendix 2 of this NIS) are in place to avoid dust and other harmful emissions that could potentially spread to the SAC habitat during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI habitats of the SAC occur.
Habitat distribution	No decline, subject to natural processes	
Vegetation composition: positive indicator species	At least seven positive indicator species present, including two "high quality" species	
Vegetation composition: negative indicator species	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	
Vegetation composition: non-native species	Cover of non-native species not more than 1%	
Vegetation composition: woody species and bracken	Cover of woody species (except certain listed species) and bracken (Pteridium aquilinum) not more than 5% cover	
Vegetation structure: broadleaf herb: grass ratio	Broadleaf herb component of vegetation between 40% and 90%	

Vegetation structure: sward height	At least 30% of sward between 5cm and 40cm tall	
Vegetation structure: litter	Litter cover not more than 25%	
Physical structure: bare soil	Not more than 10% bare soil	
Physical structure: disturbance	Area of the habitat showing signs of serious grazing or other disturbance less than 20m²	

7.2.1.1 Determination on potential for adverse effects

Based on the above, following the implementation of mitigation measures that are outlined in Section 6.2.3 of this report it can be concluded, in view of the best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) [6210] habitat associated with Killeglan Grassland SAC.

7.3 Four Roads Turlough SAC [001637]

As described in Section 6.1 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 release of pollutants including suspended solids and hydrocarbons, potentially affecting the following groundwater dependant habitats and supporting habitats for aquatic fauna:

- Turloughs [3180]

Mitigation measures have been incorporated into the Proposed Development for the avoidance of impact as fully described in Section 6.2 of this NIS. The potential for residual adverse effect on these QI habitats and species has therefore been assessed in the following subsections.

7.3.1 Turloughs [3180]

An assessment of the Proposed Development against the attributes and targets for this habitat is provided in Table 7.3.

Table 7-3: Targets and attributes associated with the site-specific conservation objectives for Turloughs

Attribute	Target	Assessment
Habitat area	Area stable at c. 72ha 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
Habitat distribution	No decline, subject to natural processes	
Hydrological regime	Maintain/restore appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	

Soil type	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	distribution as a result of the proposals and no deterioration in the condition of terrestrial habitat due to the proposed works. The only identified pathway for effect is via indirect groundwater 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 project CEMP (Appendix 2 of this NIS) and the detailed hydrological assessment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes to groundwater flow during construction, operation and decommissioning. These mitigation measures are judged to be sufficient to ensure that no residual impacts on QI habitats of the SAC occur.
Soil nutrient status: nitrogen and phosphorus	Restore nutrient status appropriate to soil types and vegetation communities	
Physical structure: bare ground	Maintain sufficient wet bare ground, as appropriate	
Chemical processes: calcium carbonate deposition and concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	
Active peat formation	Maintain active peat formation, where appropriate	
Water quality	Restore appropriate water quality to support the natural structure and functioning of the habitat	
Vegetation composition: area of vegetation communities	Maintain area of sensitive and high conservation value vegetation communities/units	
Vegetation composition: vegetation zonation	Maintain/restore vegetation zonation/mosaic characteristic of the turlough	
Vegetation structure: sward height	Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	
Typical species	Maintain/restore typical species within and across the turlough	
Fringing habitats: area	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	
Vegetation structure: turlough woodland	Maintain appropriate turlough woodland diversity and structure	

7.3.1.1 Determination on potential for adverse effects

Based on the above, and following implementation of best practice measures that are outlined in Sections 3 and 5 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Turloughs [3180] associated with

Four Roads Turlough SAC. The mitigation measures specified in Section 6.2.1 and 6.2.2 are judged to be sufficient to ensure that no residual impacts on this QI habitat of the SAC occurs.

7.4 River Shannon Callows SAC [000216]

As described in Section 6.1 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 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]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* [91E0]
- 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.

7.4.1 Alkaline fens

Table 7-4: Targets and attributes associated with the site-specific conservation objectives 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 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 proposals and no deterioration in the condition of terrestrial habitat due to the proposed works. The only identified pathway for effect is via indirect groundwater 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 project CEMP (Appendix 2 of this NIS) and the detailed hydrological assessment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes to surface and groundwater flow
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	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.
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: non-native species	Cover of non-native species less than 1%	
Vegetation composition: native trees and shrubs	Cover of scattered native trees and shrubs less than 10%	
Vegetation 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	
Transitional areas between fen and adjacent habitats	Maintain adequate transitional areas to support/protect the alkaline fen habitat and the services it provides	

7.4.1.1 Determination on potential for adverse effects

Based on the above, and following implementation of construction measures that are outlined in Section 3 and mitigation set out in Section 6.2 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect alkaline fens associated with River Shannon Callows SAC. The mitigation measures specified in Section 6.2.1 and 6.2.2 are judged to be sufficient to ensure that no residual impacts on this QI habitat of the SAC occurs.

7.4.2 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)*

*Table 7-5: Targets and attributes associated with the site-specific conservation objectives for Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)**

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 proposals and no deterioration in the condition of terrestrial habitat due to the proposed works. The only identified pathway for effect is via indirect groundwater 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 project CEMP (Appendix 2 of this NIS) and the detailed hydrological assessment, Appendix 3 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*)* habitats of the SAC occur.
Habitat distribution	No decline, subject to natural processes	
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 herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	
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	
Woodland structure: dead wood	At least 19 stems/ha of dead wood at least 20cm diameter	

Woodland structure: veteran trees	No decline	
Woodland structure: indicators of local distinctiveness	No decline in distribution and, in the case of red listed and other rare or localised species, population size	
Woodland structure: indicators of overgrazing	All five indicators of overgrazing absent	
Vegetation composition: native tree cover	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	
Vegetation composition: typical species	At least 1 target species for 91E0* woodlands present; at least 6 positive indicator species for 91E0* woodlands present	
Vegetation composition: negative indicator species	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	
Vegetation composition: problematic native species	Cover of common nettle (*Urtica dioica*) less than 75%	

7.4.2.1 Determination on potential for adverse effects

Based on the above, and following implementation of construction measures that are outlined in Section 3 and mitigation set out in Section 6.2.1 and 6.2.2 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* associated with Four Roads Turlough SAC. The mitigation measures specified in Section 6.2 are judged to be sufficient to ensure that no residual impacts on this QI habitat of the SAC occurs.

7.4.3 Otter

Distribution

Otter signs, i.e. otter spraint, was recorded downstream of the proposed Grid Connection route along the Owenkillew River and its tributaries. The location of the otter records within the study area boundary is shown in Figure 4-5. No signs of otter holts, slides prints or spraints were recorded. Although the detailed conservation objectives supporting document (NPWS, 2011) states that 'otters will utilise freshwater habitats from estuary to headwaters' the Proposed Development site is located in excess of ~5km (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 43 and 6.2 of this NIS, the project CEMP (Appendix 2 of this NIS) and Chapter 9 'Water' of the associated EIAR, Appendix 3 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 EIAR Site Boundary and none were identified in the vicinity of the proposed works. There will be no decline in couching or holt sites associated with the Proposed Development.

As outlined in Section 5, prior to any works being carried out, a pre-construction Otter survey will be undertaken by a qualified ecologist to ensure that Otter has not taken up residence within or close to the proposed works area.

Should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006).

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 5, 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.

7.4.3.2 Determination on potential for adverse effects

Based on the above, and following implementation of best practice measures that are outlined in Sections 3 and 5 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the pProposed Development will not adversely affect Alkaline Fens [7230], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* [91E0] or otter [1355] associated with River Shannon Callows SAC.

7.5 Lough Croan Turlough SPA [004139]

7.5.1 SCI SPECIES

Direct effects on the two SCI species screened in for detailed assessment, Greenland white-fronted goose and European golden plover, were assessed in detail in Table 6-6 (Section 6.1.5.1). No mitigation measures are considered necessary in relation to potential direct effects on the relevant SCI species, therefore residual effects remain the same as those assessed in Table 6-6. Based on the assessment presented in Table 6-6, there will be no significant effect on the relevant SCI species and therefore no

adverse effect on the integrity of Lough Croan Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

Indirect effects on wetland sites designated for their non-avian interest, that could potentially support SCI species forming part of Lough Croan Turlough SPA, were assessed in detail in Section 6.1.5.2. After the implementation of the mitigation measures specified in Section 6.2, there will be no significant effects on the SCI species, and no adverse effect on the integrity of Lough Croan Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

7.6 River Suck Callows SPA [004097]

7.6.1 SCI SPECIES

Direct effects on the five SCI species screened in for detailed assessment, whooper swan, Eurasian wigeon, European golden plover, Northern lapwing and Greenland white-fronted goose, were assessed in detail in Table 6-7 (Section 6.1.6.1). No mitigation measures are considered necessary in relation to potential direct effects on the relevant SCI species, therefore residual effects remain the same as those assessed in Table 6-7. Based on the assessment presented in Table 6-7, there will be no significant effect on the relevant SCI species and therefore no adverse effect on the integrity of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

Indirect effects on wetland sites designated for their non-avian interest, that could potentially support SCI species forming part of River Suck Callows SPA, were assessed in detail in Section 6.1.6.2. After the implementation of the mitigation measures specified in Section 6.2, there will be no significant effects on the SCI species, and no adverse effect on the integrity of River Suck Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

7.6.2 Wetlands and Waterbirds [A999]

An assessment of the Proposed Development against the attributes and targets for this SCI habitat is provided in Table 7.6 below.

Table 7-6: Targets and attributes associated with the site-specific conservation objectives for Wetland and Waterbirds [A999].

Attribute	Target	Assessment
Habitat Area	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 588 hectares, other than that occurring from natural patterns of variation.	There will be no direct loss or decrease in wetland habitat associated with the Proposed Development as the footprint of the development is entirely outside of the boundary of the SPA. The potential for indirect habitat loss as a result of deterioration in wetland habitat was considered. There will be no instream works. The only identified pathway for effect is via indirect surface water deterioration and changes in hydrological regime. 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 project CEMP, Appendix 2 of this NIS, and the detailed hydrological assessment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes in groundwater flow during construction, operation and decommissioning.

7.6.2.1 Determination on potential for adverse effects

Based on the above, and following implementation of best practice measures that are outlined in Sections 3 and 5 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Wetland and Waterbirds [A999] associated with River Suck Callows SPA [004097].

7.7 Four Roads Turlough SPA [004140]

7.7.1 SCI SPECIES

Direct effects on the two SCI species screened in for detailed assessment, European golden plover and Greenland white-fronted goose, were assessed in detail in Table 6-9 (Section 6.1.7.1). No mitigation measures are considered necessary in relation to potential direct effects on the relevant SCI species, therefore residual effects remain the same as those assessed in Table 6-69. Based on the assessment presented in Table 6-9, there will be no significant effect on the relevant SCI species and therefore no adverse effect on the integrity of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

Indirect effects on wetland sites designated for their non-avian interest, that could potentially support SCI species forming part of Four Roads Turlough SPA, were assessed in detail in Section 6.1.7.2. After the implementation of the mitigation measures specified in Section 6.2, there will be no significant effects on the SCI species, and no adverse effect on the integrity of Four Roads Turlough SPA, in light of its conservation objectives, as a result of the Proposed Development.

7.7.2 Wetlands and Waterbirds [A999]

An assessment of the Proposed Development against habitat area and a generic reasonable target for this SCI habitat is provided in Table 7.7 below.

Table 7-7: Targets and attributes associated with the site-specific conservation objectives for Wetland and Waterbirds [A999].

Attribute	Target	Assessment
Habitat Area	The permanent area occupied by the wetland habitat should be stable other than that occurring from natural patterns of variation.	There will be no direct loss or decrease in wetland habitat associated with the Proposed Development as the footprint of the development is entirely outside of the boundary of the SPA. The potential for indirect habitat loss as a result of deterioration of wetland habitat was considered. There will be no instream works. The only identified pathway for effect is via indirect surface water deterioration and changes in hydrological regime. 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 project CEMP and the detailed hydrological assessment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes to groundwater flow during construction, operation and decommissioning.

7.7.2.1 Determination on potential for adverse effects

Based on the above, and following implementation of best practice measures that are outlined in Sections 3 and 6.2 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Wetland and Waterbirds [A999] associated with Four Roads Turlough SPA [004140].

No pathway for effect on supporting wetland habitat for SCI bird species exists for this SPA.

7.8 Lough Ree SPA [004064]

7.8.1 SCI SPECIES

Direct effects on the seven SCI species screened in for detailed assessment, Eurasian wigeon, Eurasian teal, mallard, common scoter, Eurasian coot, European golden plover and northern lapwing, were assessed in detail in Table 6-11 (Section 6.1.8.1). No mitigation measures are considered necessary in relation to potential direct effects on the relevant SCI species, therefore residual effects remain the same as those assessed in Table 6-11. Based on the assessment presented in Table 6-11, there will be no significant effect on the relevant SCI species and therefore no adverse effect on the integrity of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development.

Indirect effects on wetland sites designated for their non-avian interest, that could potentially support SCI species forming part of Lough Ree SPA, were assessed in detail in Section 6.1.8.2 After the implementation of the mitigation measures specified in Section 6.2, there will be no significant effects on the SCI species, and no adverse effect on the integrity of Lough Ree SPA, in light of its conservation objectives, as a result of the Proposed Development.

7.9 Middle Shannon Callows SPA [004096]

7.9.1 SCI SPECIES

Direct effects on the four SCI species screened in for detailed assessment, Eurasian wigeon, European golden plover, northern lapwing and black-headed gull, were assessed in detail in Table 6-12 (Section 6.1.9.1). No mitigation measures are considered necessary in relation to potential direct effects on the relevant SCI species, therefore residual effects remain the same as those assessed in Table 6-12. Based on the assessment presented in Table 6-12, there will be no significant effect on the relevant SCI species and therefore no adverse effect on the integrity of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

Indirect effects on wetland sites designated for their non-avian interest, that could potentially support SCI species forming part of Middle Shannon Callows SPA, were assessed in detail in Section 6.1.9.2. After the implementation of the mitigation measures specified in Section 6.2, there will be no significant effects on the SCI species, and no adverse effect on the integrity of Middle Shannon Callows SPA, in light of its conservation objectives, as a result of the Proposed Development.

7.9.2 Wetlands and Waterbirds [A999]

An assessment of the Proposed Development against habitat area and a generic reasonable target for this SCI habitat is provided in Table 6.19 below.

Table 7-8: Attributes and targets associated with the site-specific conservation objectives for Wetland and Waterbirds [A999].

Attribute	Target	Assessment
Habitat Area	The permanent area occupied by the wetland habitat should be stable, other than that occurring from natural patterns of variation.	There will be no direct loss or decrease in wetland habitat associated with the Proposed Development as the footprint of the development is entirely outside of the boundary of the SPA. The potential for indirect habitat loss as a result of deterioration in wetland habitat was considered. There will be no instream works. The only identified pathway for effect is via indirect surface water deterioration and changes in hydrological regime. 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 project CEMP (Appendix 2 of this NIS) and the detailed hydrological assesssment, Appendix 3 of this NIS) are in place to avoid all water pollution and changes to groundwater flow during construction, operation and decommissioning.

7.9.2.1 Determination on potential for adverse effects

Based on the above, and following implementation of best practice measures that are outlined in Sections 3 and 5 of this report, it can be concluded, in view of best scientific knowledge and based on objective information, that the Proposed Development will not adversely affect Wetland and Waterbirds [A999] associated with Middle Shannon Callows SPA [004096]

7.10 Conclusion of Impact Assessment

Taking cognisance of the suite of bespoke mitigation measures incorporated into the project design the Proposed Development will not result in adverse impacts on the integrity of the European Sites in light of their conservation objectives. It will not prevent the QIs/SCIs of the European Sites from achieving favourable conservation status in the future as defined in Article 1 of the EU Habitats Directive. A definition of Favourable Conservation Status is provided below:

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

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

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

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

- Ballynamona Bog And Corkip Lough SAC
- Killeglan Grassland SAC
- Four Roads Turlough SAC
- River Shannon Callows SAC
- Lough Croan Turlough SPA
- River Suck Callows SPA
- Four Roads Turlough SPA
- 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 (Appendix 1). 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.

8.1 Development context – Ecological Plans and Policies

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

- Roscommon County Development Plan 2022 - 2028
- National Biodiversity Action Plan 2017-2021
- Northern & Western Regional Assembly Regional Spatial and Economic Strategy 2020-2032 (RSES)

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 land use and spatial plans

	Key Policies/Issues/Objectives Directly Related to European Sites In The Zone of Influence	Assessment of development compliance with policy
Roscommon County Development Plan 2022 - 2028	› **Policy Objective NH. 10.4** Implement Article 6(3) and where necessary Article 6(4) of the Habitats Directive and to ensure that Appropriate Assessment is carried out in relation to works, plans and projects likely to impact on European sites (SACs and SPAs), whether directly or indirectly or in combination with any other plan(s) or project(s). All assessments must be in compliance with the European Communities (Birds and Natural Habitats) Regulations 2011. › **Policy Objective NH. 10.5** Ensure that no plans, programmes, etc. or projects are permitted that give 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 and other effects, (either individually or in combination with other plans, programmes, etc. or projects). › **Policy Objective NH 10.6** Ensure that any plan or project that could have a significant adverse impact (either alone 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.	This NIS has been prepared in respect of the Proposed Development to enable An Bord Pleanála to undertake an appropriate assessment under and in accordance with Part XAB of the Planning and Development Act 2000 as amended. There will be no adverse effects on QIs/SCI of designated sites as a result of deterioration in water quality or disturbance of QI species. The Proposed Development has been designed to avoid any effect on water quality outside the site as set out in Section 5 of this NIS.
Regional Spatial and Economic Strategy 2020-2032	**RPO 5.4** Encourage the prioritisation of Site-Specific Conservation Objectives (SSCO) for all sites of Conservation Value, designated in EU Directive (i.e. SACs, SPAs) to integrate with the development objectives of this Strategy.	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 5 of this NIS.
	RPO 5.5 Ensure efficient and sustainable use of all our natural resources, including inland waterways, peatlands, and forests in a manner which ensures a healthy society a clean environment and there is no net contribution to biodiversity loss arising from development supported in this strategy. Conserve and protect designated areas and natural heritage area. Conserve and protect European sites and their integrity.	
	RPO 5.7 Ensure that all plans, projects and activities requiring consent arising from the RSES are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate.	
National Biodiversity Action Plan 2017-2021	**Target 6.2** - Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020.	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.

8.2 Other Projects

Assessment material for this in-combination impact assessment was compiled on the relevant developments within the vicinity of the Proposed Development and was verified on the 30/05/2022. The material was gathered through a search of relevant online Planning Registers, reviews of relevant documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts. All relevant projects were considered in relation to the potential for in-combination effects. All relevant data was reviewed (e.g. individual EISs/EIARs, layouts, drawings etc.) for all relevant projects where available. These are listed below.

8.2.1 On Site Met Masts Applications

As detailed in Table 8-2, Energia Renewables Ireland Ltd. has applied to Roscommon County Council for the erection of two guy-wired lattice meteorological mast of up to 100 metres in height within the Proposed Development site; one being located in within the townland of Skeavalley, the second located within the townland of Cronin; for a period of 5 years.

Table 8-2: Met Mast applications within the proposed development site

Pl. Ref	Description	Decision
21/274	Erection of a temporary meteorological mast - the development will consist of: The erection of a guy-wired lattice meteorological mast of up to 100 metres in height; Associated works, services and foundations area, planning permission is sought for a period of 5 years	Pending – Further Information Requested
21/275	Erection of temporary meteorological mast - the development will consist of: The erection of a guy - wired lattice meteorological mast of up to 100 metres in height; Associated works, services and foundations area, planning permission is sought for a period of 5 years	Pending – Further Information Requested

In the case of both of the above applications further information has been submitted by MKO to Roscommon County Council following a Request for Further Information (RFI) dated 19/07/2021. The updated AA Screening Reports submitted for the above applications (MKO, April 2022) state that:

'*It can be concluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed mast development, individually or in combination with other plans and projects, will not have any significant effects on any European Designated Sites.*'

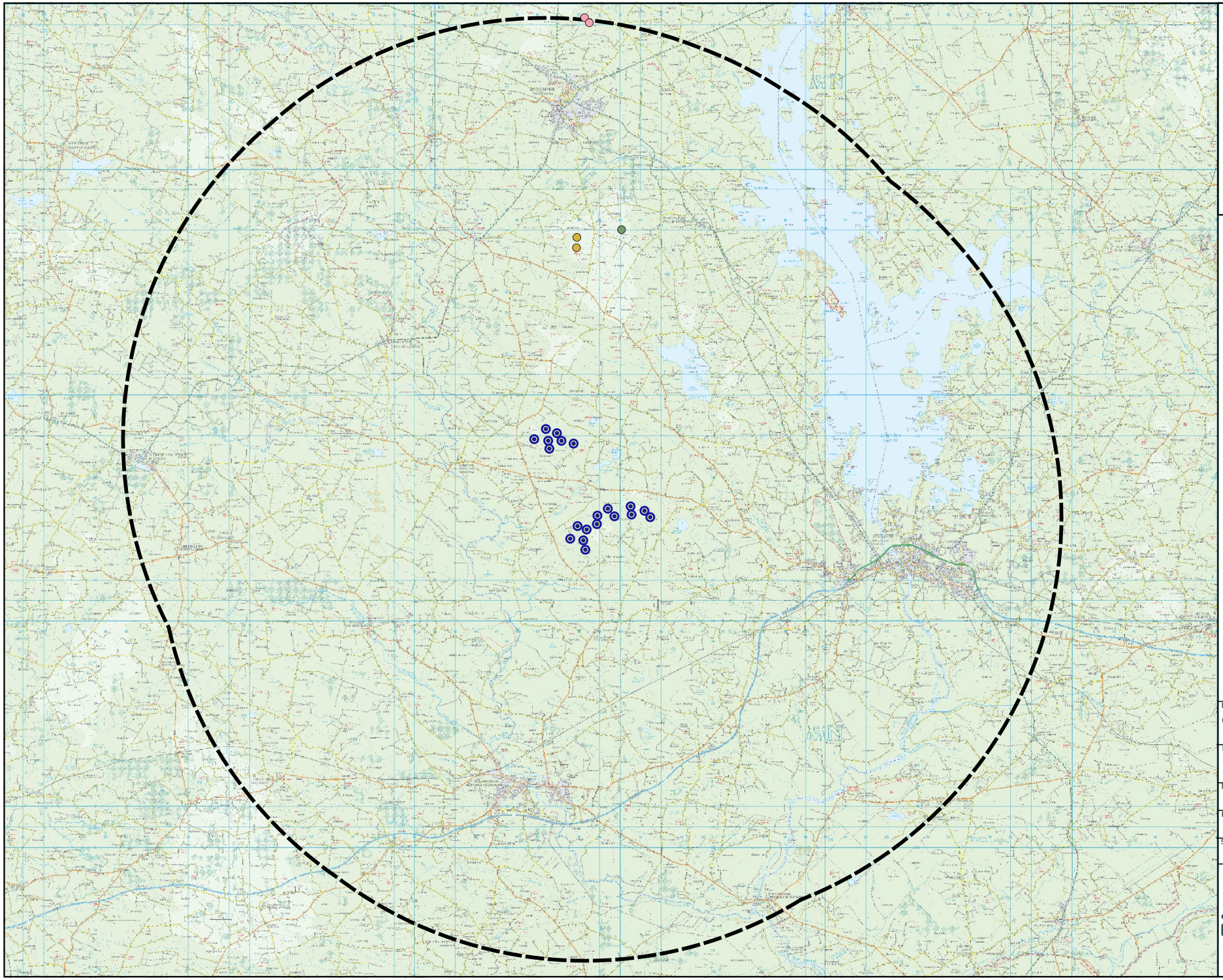
No potential additive impacts have been identified which would result in the potential for significant cumulative impacts with the Proposed Development. Taking into consideration also the fact that no significant residual impacts have been identified for the proposed Seven Hills Wind Farm (post mitigation), significant cumulative impacts on European sites in combination with the Proposed Development are not anticipated.

8.2.2 Other Wind Farm Sites

Within the wider area, there have been a number of planning applications for wind farm developments (comprising two or more turbines) lodged within a 20-kilometre radius of the study area. These wind farms applications are based on a review of the Roscommon County Council Planning Register and include those listed in the following subsections. 20km was considered to be an appropriate distance for consideration of other wind energy developments given that likely zone of influence of this project has

been identified as being 15km and the only existing wind farm also within the River Shannon catchment (the Skrine Wind Farm) is located ~8.5km from the Proposed Development site.

Table 8.2 lists the existing and permitted wind farms located in Co. Roscommon within 20-kilometre radius of the Proposed Development site. The locations of the wind farms are shown in Figure 8-1.



Map Legend

- Proposed Development Turbine Layout
- 20km Buffer of Turbines
- Existing Skrine Wind Farm
- Proposed Kilcash Turbine
- Permiited Derrane Wind Farm

Drawing Title
Other Wind Farms within 20km of Proposed Development

Project Title
Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
DN	ÓM
Project No.	Drawing No.
190907	Figure 8-1
Scale	Date
1:240000	31.05.2022

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

Table 8-3: Wind energy application within 20km

Pl.Ref	Description	Decision
Skrine Wind Farm (Approx 8.5km to the north of the subject site)		
04/103	For 3 wind turbine generators, one meteorological tower, one substation and substation compound and associated site access roads.	Granted by RCC Granted by An Bord Pleanála (Ref: 208733) 20/01/2005 2 turbines constructed
10/3002	Application for extension of duration re PD/04/103, For 3 wind turbine generators, one meteorological tower, one substation and substation compound and associated site access roads	Granted by RCC 24/02/2010
Derrane Wind Farm (approx. 20km north of the subject site)		
11/126	Erect two number 2.3MW wind turbines, of up to 85 metre hub height and up to 82 metre rotor diameter with a total height not exceeding 126 metres, associated site works to include new internal site tracks, upgrading existing site tracks, turbine hardstands, control sub station, and cabling works	Granted by RCC 03/01/2012
18/313	Minor technical amendments to the development permitted under Reference 11/126 to provide for the relocation and redesign of the permitted control substation; the construction and re-alignment of internal site access tracks; redesign of permitted hardstand areas; re-alignment of cabling works; minor upgrade works to permitted site entrance; and all associated site development and reinstatement works	Granted by RCC 28/09/2018
18/447	Minor amendments to the development permitted under Roscommon County Council Planning Register References 11/126 and 18/313 to provide for the relocation of the permitted wind turbines and associated infrastructure (site roads and crane hard- standings); amendments to the turbine dimensions to allow for a maximum overall tip height of up to 150 metres and all associated site development and reinstatement works.	Refused by RCC Granted by An Bord Pleanála (303677) 12/07/2019
20/145	For development consisting of minor amendments to the development permitted under Roscommon County Council Planning Register Reference 18/313 to provide for (i) the relocation of the permitted control substation approximately 810 metres to the north, (ii) omission of access track and underground electrical cabling associated with the permitted control substation, (iii) installation of approximately 530 metres of underground electrical cabling to connect the proposed control substation to permitted wind turbine T1 and (iv) all associated site development access and reinstatement works at	Granted by RCC Granted by An Bord Pleanála (307726) 12/11/2020 Not yet constructed
21/3007	Extension of duration for 11/126.	Granted by RCC 12/04/2021
Kilcash Wind Farm (Approx. 10.3km north of the subject site)		
21/221	Construction of one 4.2 MW wind turbine with overall tip height of up to 150m including on-site 20kV substation and underground electrical cable; All associated site development and ancillary works.	Refused by RCC 20/01/2021; Appealed to An Bord Pleanála (ref: 312748-22), Pending

Skrine Wind Farm

The potential for the Proposed Development to result in significant cumulative or in combination effects when assessed alongside Skrine wind farm, a 3-turbine development which is c. 8.5km to the north of the Proposed Development was considered. The planning file was reviewed on the Roscommon County Council Planning Register and no 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 Seven Hills Winds Farm when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative impacts with the Proposed Development. Taking into consideration also the fact that no significant residual impacts have been identified for the proposed Seven Hills Wind Farm (post mitigation), significant cumulative impacts on European sites in combination with the Proposed Development are not anticipated.

Derrane Wind Farm

The potential for the Proposed Development to result in significant cumulative or in combination effects when assessed alongside Derrane Wind Farm, a 2-turbine development which is c. 20km to the north of the Proposed Development was considered. The planning file was reviewed on the Roscommon County Council Planning Register and no 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 Seven Hills Winds Farm when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative impacts with the Proposed Development. Taking into consideration also the fact that no significant residual impacts have been identified for the proposed Seven Hills Wind Farm (post mitigation), significant cumulative impacts on European sites in combination with the Proposed Development are not anticipated.

Kilcash Wind Farm

The potential for the Proposed Development to result in significant cumulative or in combination effects when assessed alongside Kilcash Wind Farm, a single turbine development which is c. 10.3km to the north of the Proposed Development was considered. The planning file was reviewed on the Roscommon County Council Planning Register; the development has been refused by RCC pending an appeal, on the grounds that insufficient information had been provided as to whether the development could result in adverse impacts on European Sites. However, the following factors limit the potential for significant cumulative effects to result if this development was to be subsequently granted permission: 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 Seven Hills Winds Farm when considered on its own.

No potential additive impacts have been identified which would result in the potential for significant cumulative impacts with the Proposed Development. Taking into consideration also the fact that no significant residual impacts have been identified for the proposed Seven Hills Wind Farm (post mitigation), significant cumulative impacts on European sites in combination with the Proposed Development are not anticipated.

8.2.3 Non-Renewable Energy Developments

Table 7-3 below lists non-renewable energy development existing and approved projects as well as planning applications pending a decision within approximately 2km of the proposed locations of turbines within the Proposed Development. Here a 2km distance from the Wind Farm 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 considered to be proportional to the likely zone of influence of the developments listed below, which are relatively small-scale.

Table 8-4: Non-renewable energy development applications in the vicinity of the proposed turbine infrastructure

Pl. Ref	Description	Decision
16/41	Development of a new dwelling house with proprietary effluent treatment system and soil polishing filter, new road entrance and all ancillary site works	Granted by RCC 03/05/2016
16/43	To erect dwelling house and to construct septic tank and percolation area	Granted by RCC 03/05/2016
16/104	To construct a four bay slatted cattle shed and a four bay calving shed on his lands	Granted by RCC 01/06/2016
16/251	To construct dwellinghouse, domestic garage and install waste water treatment unit with polishing filter	Granted by RCC 02/09/2016
16/476	For erection of dwelling house and domestic garage with sewerage treatment plant and percolation area and associated site development works	Granted by RCC 12/05/2017
17/63	To carry out alterations/extend dwelling house	Granted by RCC 08/05/2017
17/106	For a new dwelling, domestic garage, proprietary effluent treatment system and soil polishing filter, new road entrance, and all associated ancillary site development works	Granted by RCC 04/09/2017
17/136	To construct a dwelling house and install a waste water treatment unit with polishing filter	Granted by RCC 27/06/2017
17/211	To construct a dwelling house, domestic garage and septic tank with percolation area and all associated site works	Granted by RCC 19/09/2017
17/294	Development consisting of extension to rear and to side of existing dwelling house and carrying out all ancillary site works	Refused by RCC 11/08/2017
17/397	To construct a private dwelling house, a domestic garage and sewerage treatment system with all other site services	Granted by RCC 11/04/2018
18/166	Planning permission to erect extension/carry out alterations to dwelling house and to construct ancillary site works	Granted by RCC 02/11/2018
17/397	To construct a private dwelling house, a domestic garage and sewerage treatment system with all other site services	Granted by RCC 11/04/2018
17/420	The development will consist of a new dwelling house, garage, entrance, proprietary effluent treatment system and	Granted by RCC 01/10/2018

	soil polishing filter, connection to services and all ancillary site works	
18/329	To construct a dwelling house, domestic garage and single dwelling treatment system with percolation area and associated site works	Granted by RCC 12/11/2018
18/407	To construct a slatted shed to include concrete apron and all associated works	Granted by RCC 05/11/2018
18/496	Deletion of Condition No. 17 of previously granted planning permission reference PD/02/578	Granted by RCC 03/12/2018
18/631	To erect a domestic garage/fuel shed and to construct ancillary site works	Granted by RCC 19/03/2019
19/4	Retention to erect extensions to the side and rear of dwelling house and to retain domestic garage/fuel shed	Granted by RCC 09/04/2019
19/43	Development consisting of the following:- (1) Slatted shed; (2) Silage base; (3) Sheep shed; (4) Retain existing loose shed together with all associated site works	Granted by RCC 08/05/2019
19/71	For development consisting of a 2 storey dwelling, sewage treatment plant, percolation area, new site entrance, new garage with associated site works	Granted by RCC 15/05/2019
19/77	For erection of dwelling house and domestic garage with sewerage treatment plant and percolation area, and ancillary site development works	Granted by RCC 04/06/2019
19/85	To demolish derelict dwelling and outbuildings and construct new part single storey/part two storey dwelling, detached domestic garage, use and upgrade existing entrance, effluent treatment system, percolation area and associated site works	Granted by RCC 15/05/2019
19/451	For development consisting of a bungalow dwelling, septic tank, percolation area and new entrance	Granted by RCC 10/12/2019
19/632	Permission to construct a five bay double slatted sheep shed on lands	Granted by RCC 12/03/2020
20/1	Permission for proposed agricultural shed, a new site entrance, retention of garage, retention of relocation of septic tank percolation area as per Planning Permission previously granted under Ref. No. PD/04/81 and all associated works.	Granted by RCC 22/12/2020
20/117	To construct dwelling house, domestic garage and install waste water treatment unit with polishing filter	Granted by RCC 14/08/2020
20/139	Retention for domestic garage and fuel storage shed constructed on site and all associated site works	Granted by RCC 14/08/2020
20/276	To construct dwelling house, domestic garage, treatment system and all ancillary site development works	Granted by RCC 26/01/2021
20/323	To construct a four bay single loose cattle shed and dungstead on lands.	Granted by RCC 27/10/2020

20/364	For development which will consist of a new dwelling, garage, gated entrance, wastewater treatment system and polishing filter and all ancillary site works	Granted by RCC 11/02/2021
20/398	For the construction of a single storey dwelling house and a domestic garage together with the installation of a waste water treatment system / percolation area and all necessary site services / ancillary siteworks.	Granted by RCC 17/06/2021
20/412	For the construction of a dwelling house, domestic garage, the installation of a sewerage treatment unit and percolation area along with connections to all site services and all other associated site works	Granted by RCC 04/03/2021
20/415	To construct a dwelling house, garage, waste water treatment system & associated siteworks	Granted by RCC 15/01/2021
20/486	For demolition of old dwelling house on site, and for erection of new dwelling house and domestic garage, with septic tank and percolation area and ancillary site development works	Granted by RCC 04/03/2021
20/516	To erect a dwelling house, a domestic garage, install a secondary waste treatment unit with soil polishing filter and to construct all ancillary site works to facilitate same.	Granted by RCC 18/03/2021
21/42	To construct 5 bay machinery / storage shed together with associated siteworks	Granted by RCC 29/04/2021
21/103	To construct a new residential dwelling and shed	Granted by RCC 11/07/2021
21/237	Permission to construct a dwelling house, garage, waste water treatment system & associated siteworks	Granted by RCC 05/07/2021

Finally, a review of all projects (existing and permitted) within 200 meters of the Grid Connection route have been reviewed. The 200 meter distance from the Grid Connection route reflects a generous and conservative range in terms of identifying permissions which may have the potential for cumulative effects having regard to the nature of the Grid Connection works (i.e. construction and operation of underground cabling). Many of the noted applications relate to agricultural developments and/or single residential developments. Table 7-4 below lists those existing and approved projects as well as planning applications pending a decision identified within 200 meters of the Grid Connection works.

Table 8-5: Other Developments Within 200 Meters of the Grid Connection Route

Pl. Ref:	Description	Decision
16/19	Change of use of a takeaway and additional floor space	Granted by RCC 16/03/2016
16/297	Construct an admin building as per Pl Ref 04/1176	Granted by RCC 11/11/2016
16/415	Construct 6 no. houses	Granted by RCC 24/04/2017
17/269	Change of use to the rear of a dwelling	Granted by RCC 31/01/2018
17/420	Construct a dwelling house	Granted by RCC 23/08/2018
17/465	Construct 27 no. dwelling houses	Granted by RCC 29/05/2018

18/197	Change of use of a bookmakers and amendments to Pl Ref 07/1440	Granted by RCC 31/05/2018
18/280	Extension to dwelling house	Granted by RCC 13/07/2018
18/399	Construct a dwelling house	Granted by RCC 19/10/2018
19/63	Construct extension to dwelling house	Granted by RCC 28/03/2019
19/82	Development of a new ground floor lobby	Granted by RCC 05/06/2019
19/283	Change of use of a premises to early learning centre from commercial	Granted by RCC 18/07/2019
19/592	Construct a domestic dwelling	Granted by RCC 17/01/2020
20/421	Retail extension	Granted by RCC 19/01/2021
20/519	Raise the height of side boundary	Granted by RCC 08/02/2021
20/556	Amendments to Pl Ref 17/465	Granted by RCC 17/05/2021
21/103	Construct a dwelling house	Granted by RCC 09/07/2021
21/113	Construction of a retail store	Granted by RCC 23/04/2021
21/377	Extension to dwelling house	Granted by RCC 27/08/2021
21/507	Sub division of a retail unit with an additional shop opening	Decision due 02/11/2021

The majority of non-renewable energy related planning applications in the immediate vicinity of the proposed wind farm site are related to the provision and/or alteration of one-off housing, retail, amenity and agricultural developments. Due the relatively small-scale nature of many of the above developments, the separation in distance, the absence of effects identified as a result of the Proposed Development and absence of in-combination impact pathways identified, the above developments are do not represent any potential for in-combination impacts.

The Roadstone Quarry at Cam (application ref. 04/1479) located to the south of the R363 is approximately 100m from the closest infrastructure proposed as part of the Seven Hills Wind Farm development. Works at the quarry will continue throughout the construction and operation of the Proposed Development. No potential additive impacts have been identified which would result in the potential for significant cumulative impacts with the Proposed Development. Taking into consideration also the fact that no significant residual impacts have been identified for the proposed Seven Hills Wind Farm (post mitigation), significant cumulative impacts on European sites in combination with the Proposed Development are not anticipated.

8.3 Cumulative and In-Combination Effects Assessment for SCI Bird Species

Potential in-combination effects on SCI bird species for the five SPAs that have been screened in for detailed assessment have been considered in relation to other operational and consented wind farms, and wind farms under consideration by the local planning authority, within 20 km of the Proposed Development. Wind farm applications within this area which have been refused consent have not been included in the assessment.

There are three other wind farm developments located within 20 km of the Proposed Development:

- Skrine Wind Farm (2 turbines), which lies approximately 8.5 km north of the site and consists of two constructed turbines;
- Derrane Wind Farm (2 turbines), which is located approximately 20 km north of the site and consists of two turbines not yet constructed; and
- Kilcash Wind Farm (1 turbine), located approx. 10.3km north of the subject site, currently under consideration by the An Bord Pleanála following refusal by Roscommon County Council

No documents relevant to ornithology for Skrine Wind Farm or Derrane Wind Farm were available in an online search suggesting it as not assessed given the small size of the schemes and therefore no quantitative assessment of cumulative effects for these projects is possible. However, given the separation distances, and given that both wind farms contain only two turbines each, significant cumulative effects are very unlikely. This is because the further away two wind farms are from each other, the lower the likelihood that bird populations will be affected by both wind farms. Similarly, the fewer turbines that are present in each wind farm, the lower the additive cumulative collision risk.

For Kilcash Wind Farm, according to the NIS written in November 2021 by EirEco, bird surveys carried out to inform the planning application for Kilcash Wind Farm recorded the following SCI species: European golden plover, Northern lapwing, whooper swan and mallard.

Given the separation distance between Kilcash Wind Farm and the site, any cumulative negative effects of habitat loss or disturbance to SCI bird species are very unlikely to be significant. Similarly, Kilcash Wind Farm is located within a separate WFD (Water Framework Directive) sub-catchment and there is no hydrogeological link between the two proposed wind farms meaning cumulative effects resulting from indirect habitat loss are unlikely. Given that Kilcash Wind Farm consists of a single turbine and given the intervening distance, there is no realistic potential for significant in-combination negative effects due to barrier effects or operational displacement upon VORs. In terms of collision risk, collision risk modelling was not undertaken for Kilcash and therefore a quantitative assessment of cumulative collision risk is not possible, although the lack of collision risk modelling for Kilcash suggests that collision risk was considered to be negligible for all species. However, given the separation distance, and given that Kilcash is only a single turbine, significant cumulative effects resulting from collision are very unlikely. This is because the further away two wind farms are from each other, the lower the likelihood that bird populations will be affected by both wind farms. Similarly, the fewer turbines that are present in each wind farm, the lower the additive cumulative collision risk.

Other (non- wind farm) projects with the potential to have cumulative negative effects on SCI bird species for the five SPAs screened in for detailed assessment include the operational Cam Roadstone Quarry (application ref. 04/1479), which is located to the south of the R363 and is approximately 100 m from the site. It is assumed that works at the quarry will continue throughout the construction and operation of the Proposed Development. The only cumulative effect that may occur is possible disturbance to SCI birds from noise and human/vehicular presence, particularly during construction of the wind farm. Given that the quarry has been operational for several years, it is likely any SCI birds have habituated to the quarry's presence. Therefore, there is not predicted to be any significant cumulative negative effects on SCI bird species as a result of the construction and operation of the Proposed Development.

Other projects within the local area are limited to minor proposals such as one-off dwelling houses and agricultural developments and are not considered to have the potential for significant cumulative negative effects on SCI bird species for the five SPAs screened in for detailed assessment.

The detailed hydrological assessment undertaken for the Proposed Development (see Appendix 3) concluded that, following mitigation, there were no significant negative cumulative effects on groundwater-dependent habitats within any of the SPAs screened in for detailed assessment, which precludes the possibility of cumulative negative effects on SCI bird species that use such habitats.

As there are no effects predicted on SCI bird species for the five SPAs screened in for detailed assessment as a result of the proposed Grid Connection, no significant negative cumulative effects from the Grid Connection on SCI birds can occur.

8.4 Conclusion of Cumulative Assessment

Where the potential for the Proposed Development to result in adverse effects on the integrity of the European Sites on its own was identified, there was potential for it to contribute to in combination effects when considered in combination with other plans and projects. In the absence of mitigation, the potential for the Proposed Development to contribute to in combination effects on water quality within downstream the following SACs and SPAs:

- Ballynamona Bog And Corkip Lough SAC
- Killeglan Grassland SAC
- Four Roads Turlough SAC
- River Shannon Callows SAC
- Lough Croan Turlough SPA
- River Suck Callows SPA
- Four Roads Turlough SPA
- Lough Ree SPA
- Middle Shannon Callows SPA

As shown in Section 8.3, there is no potential for the Proposed Development to contribute to significant in combination effects in relation to habitat loss, construction and operational phase disturbance/displacement effects, operational collision mortality and barrier effects on SCI bird species for the following SPAs screened in for detailed assessment:

- Lough Croan Turlough SPA
- River Suck Callows SPA
- Four Roads Turlough SPA
- Lough Ree SPA
- Middle Shannon Callows SPA

Following the implementation of the bespoke mitigation measures outlined in Sections 3 and 6.2 of this report, in the 'Water' Chapter of the EIAR (Appendix 3 of this NIS), and in the CEMP (see Appendix 2 of this NIS), all potential impact pathways have been prevented. There is therefore no potential for the Proposed Development to contribute to any in-combination impact on EU Designated Sites when considered in combination with other plans and projects.

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

9. CONCLUDING STATEMENT

This NIS has provided an assessment of all potential direct or indirect pathways for adverse effects on the QI/SCI habitats and species of following European Sites that were screened in for detailed assessment:

- Ballynamona Bog And Corkip Lough SAC
- Killeglan Grassland SAC
- Four Roads Turlough SAC
- River Shannon Callows SAC
- Lough Croan Turlough SPA
- River Suck Callows SPA
- Four Roads SPA
- Lough Ree SPA
- Middle Shannon Callows SPA

All identified potential pathways for impact are robustly prevented 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, following an examination, analysis and evaluation of the relevant information, including in particular the nature of predicted impacts from the Proposed Development, and with the implementation of mitigation measures proposed, that the Proposed Development, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site and there is no reasonable scientific doubt in relation to this conclusion

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