

BORD@NAMÓNA

Naturally Driven

DERRYADD WIND FARM

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

VOLUME I

NON-TECHNICAL SUMMARY (NTS)

January 2019

TOBIN CONSULTING ENGINEERS



NON-TECHNICAL SUMMARY

PROJECT: Derryadd Wind Farm, Environmental Impact Assessment Report (EIAR)
Volume I -Non-Technical Summary

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1 INTRODUCTION

1.1 OVERVIEW OF THE PROJECT

Bord na Móna Powergen Ltd. (a subsidiary of Bord na Móna Plc and hereafter referred to as Bord na Móna) intends to apply to An Bord Pleanála for planning permission to develop a 24 no. turbine wind farm and all associated infrastructure at the Derryaroge, Derryadd, Derryshannoge and Lough Bannow substantially cutaway bogs within the Mountdillon peat production bog group in County Longford,

For the purposes of this EIAR and planning application, the proposed development is referred to as the Derryadd Wind Farm. The 'red line' boundary indicates the planning application boundary, while the 'blue line boundary' indicates the Bord na Móna landownership boundary for the Mountdillon Bog Group (See Figure 1.1- Regional Site Location Map).

The proposed wind farm site is located within the townlands of Cloonkeel, Ballynakill, Cloonbearla, Cloonbrock, Derryaroge, Mount Davys, Rappareehill, Cloonfore, Cloonfiugh, Barnacor (Ed Rathcline), Grillagh (Moydow By), Derryad (Moydow By), Annaghbeg, Annaghmore, Derryart, Derryoghil, Ards, Corralough, Cloontamore, Derrygeel, Cloontabeg, Kilmakinlan, Derrynaskea, Derryshannoge, Derraghan More, Coolnahinch (Moydow By), Derryglogher, Mosstown (Rathcline By), Corlea and Derraghan Beg.

The development site has an area of approximately 1908 hectares and is located between the towns and villages of Lanesborough (approximately 2km east, as the nearest point), Derraghan, Keenagh and Killashee while the main urban centre in the region, Longford Town, is 9km to the northeast from its nearest point. Derryaroge Bog to the north is adjacent to the River Shannon and Lough Bannow Bog is immediately to the west of the Royal Canal which runs in a north south direction.

1.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

An Environmental Impact Assessment (EIA) is required to ensure that projects that are likely to have significant effects on the surrounding area and the environment are properly assessed. Any significant impacts discovered in the assessment must be minimized and avoided where possible. The findings and outcome of the EIA are presented as a report, known as an Environmental Impact Assessment Report (EIAR).

TOBIN Consulting Engineers has prepared the EIAR in accordance with relevant and specific environmental legislation, guidance and advice notes. The report has been compiled in consultation with statutory bodies, interested parties and the local community. Further details on the consultation process are provided in Section 1.5 below.

This document is Volume 1 of the EIAR. It is a Non-Technical Summary (NTS), which gives a brief description of the project and the assessment of the relevant environmental matters in non-technical language. The additional Volumes contain information as described below:

- Volume 2: The Main EIAR – Contains detailed information relating to the proposed Derryadd Wind Farm and the findings of the Environmental Impact Assessment Report on the surrounding area. Volume 2 also contains drawings, figures and maps.
- Volume 3: Appendices: This Volume contains information and data that has been used in the Environmental Impact Assessment Report and is referred to in Volume 2.

The purpose of this NTS is to provide a concise overview, in non-technical terms, of the issues, impacts and mitigation measures highlighted by the environmental impact assessment report and presented in the main EIAR, Volume 2.

1.3 THE APPLICANT

Bord na Móna is a publicly owned company, originally established in 1946 to develop and manage some of Ireland's extensive peat resources on an industrial scale, in accordance with government policy at the time.

In 2011, Bord na Móna published a 'Strategic Framework for The Future Use of Peatlands'. The strategy establishes a framework for the on-going assessment of the company's approximately 80,000 hectares (ha) total land bank and provides for the formulation of appropriate strategies, policies and actions. The development of wind energy as an after use for cutaway peatlands is clearly indicated in this strategy. On page 39 of the 2011 strategy document, indicative zones of potential in the Midlands area are outlined on a map. The map indicates that the Moundillon bog group has wind energy development potential.

To date, Bord na Móna has a number of commissioned wind farms that are supplying energy to the National Grid including Bellacorick Wind Farm in County Mayo, Mountlucas Wind Farm in County Offaly, Bruckana Wind Farm, situated on the borders of counties Tipperary, Kilkenny and Laois, and Sliabh Bawn Wind Farm in County Roscommon (developed as a joint venture with

Coillte). In addition, Bord na Móna has recently commenced construction of Oweninny Wind Farm, County Mayo in a joint venture with ESB and, was awarded a Grant of Planning Permission for Cloncreen Wind Farm, County Offaly (May 2017).

Bord na Móna Powergen also manages and operates a number of thermal and renewable energy assets, including Edenderry Power Plant (a peat/biomass generating unit), Cushaling peaking plant and the Drehid landfill gas facility.

1.4 PLANNING APPLICATION

Bord na Móna intend to apply to An Bord Pleanála for a 10-year planning permission and 30-year operational life from the date of commissioning of the entire wind farm.

The proposed development comprises the construction of 24 no. wind turbines and ancillary works. The turbines will have a maximum blade tip height of 185m above the top of the foundation level and will be accessible from internal access routes within the Bord na Móna site.

The application includes two potential substation locations - Option A in Cloonfore townland or Option B in Derraghan More townland - and associated grid connection options. The proposed wind farm connection to the national electricity grid will be either to the existing Lanesborough/Richmond 110kV line via overhead line to Option A, or to the existing Lanesborough/Mullingar 110kV line via an underground cable or overhead line to Option B. All new build transmission connection infrastructure for this proposed development is contained within the development site, aside from a short section of underground cabling along the R392.

1.5 SCOPING AND INITIAL CONSULTATION

Scoping of the Environmental Impact Assessment (EIA)

As part of the EIA process, between 2016 and 2018, Bord na Móna and TOBIN Consulting Engineers met with the following planning authorities - An Bord Pleanála, Longford County Council and Roscommon County Council, to discuss the scope of the application for planning permission: In addition, the project team issued written consultation to a number of statutory bodies between 2016 and 2018. A “Scoping Report” accompanied the Consultation Cover Letter that issued in September 2016 and that correspondence introduced the project and the project team. Further consultation documentation was issued in April 2017 and April 2018. This consultation documentation reflected changes to the number and location of turbines.

All comments from each of the Planning Authorities have been taken into consideration in the design and assessment of this project.

Consultation

The Assessment also consisted of communicating with both statutory, non-statutory organisations and other competent parties at an early stage of the design and assessment of the project. This commenced in September 2016 and has been maintained throughout the EIA process. The purpose of consulting with these bodies was to aid in the assessment and project design. Full details of the EIA scoping and consultation are contained in Volume 2, Chapter 1 and in Appendices 1.1 to 1.3.

All comments, observations or concerns raised by consultees on the project design and impact assessment are addressed in the EIAR, with specific responses directed onto the relevant specialist for consideration.

Public Consultation

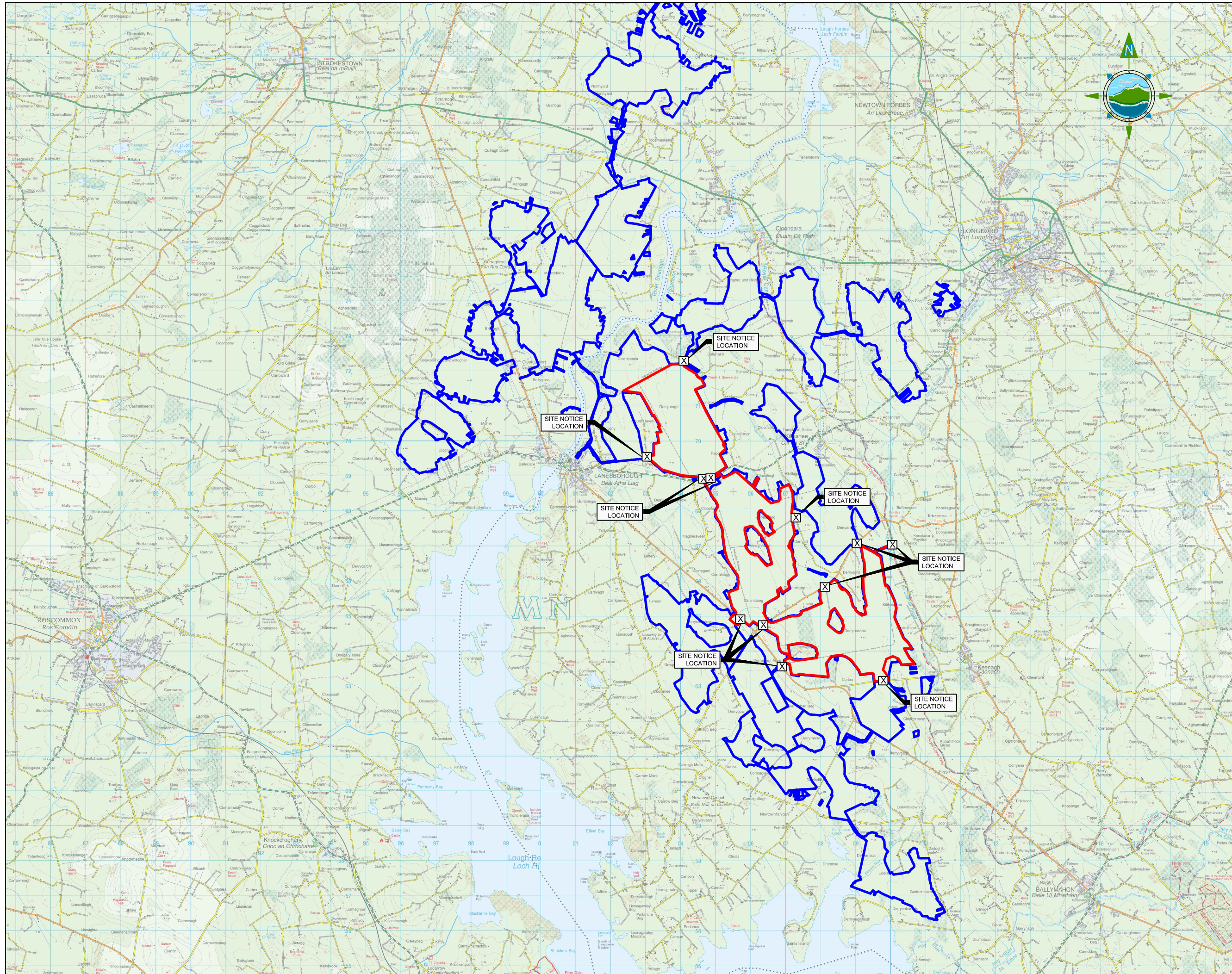
The primary form of engagement with local communities was in the form of “Public Consultation Events” which were held in the local area.

Two Public Consultation Events, providing information on the proposed project, were held in January 2016 and in September 2016. The sessions in January 2016 were to introduce the project to the local community, while the sessions in September 2016 was to represent the proposed layout to the local community. Both events were held at four locations near the proposed site, namely at Keenagh, Killashee, Newtowncashel and Lanesborough.

In addition to the above public engagement in relation to the proposed wind farm, a Community Engagement Forum was established which was chaired by an Independent Chairperson and comprised members of the local community. This forum facilitated ongoing discussions with local residents and provided the opportunity to discuss any queries in relation to the proposed development.

The primary issues raised by attendees at the event were in relation to potential landscape and visual impact, proximity of turbines to houses, community benefits, amenities and noise. These issues are addressed in Chapter 9 “Landscape and Visual Impact”, Chapter 5 “Population and Human Health” and Chapter 13 “Noise and Vibration” of this EIAR document. Specific comments and responses were directed to the relevant specialist for consideration as part of their assessment.

A full description of the Public Consultation undertaken for the Derryadd Wind Farm project is outlined in the ‘*Community Report for the Derryadd Windfarm*’ in Appendix 1.3.

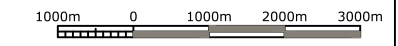


GENERAL LEGEND
 PLANNING APPLICATION BOUNDARY — PART OF LAND OWNERS PROPERTY FOLIO —

SITE NOTICE LOCATION X

- NOTES:**
1. DRAWINGS FOR PLANNING PURPOSES ONLY.
 2. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
 3. GRID REFERENCES TO IRISH NATIONAL GRID.
 4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

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A	Jan. '19	PLANNING ISSUE	MN	ST

Client: **BORD NA MÓNA**
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Project: **DERRYADD WIND FARM**

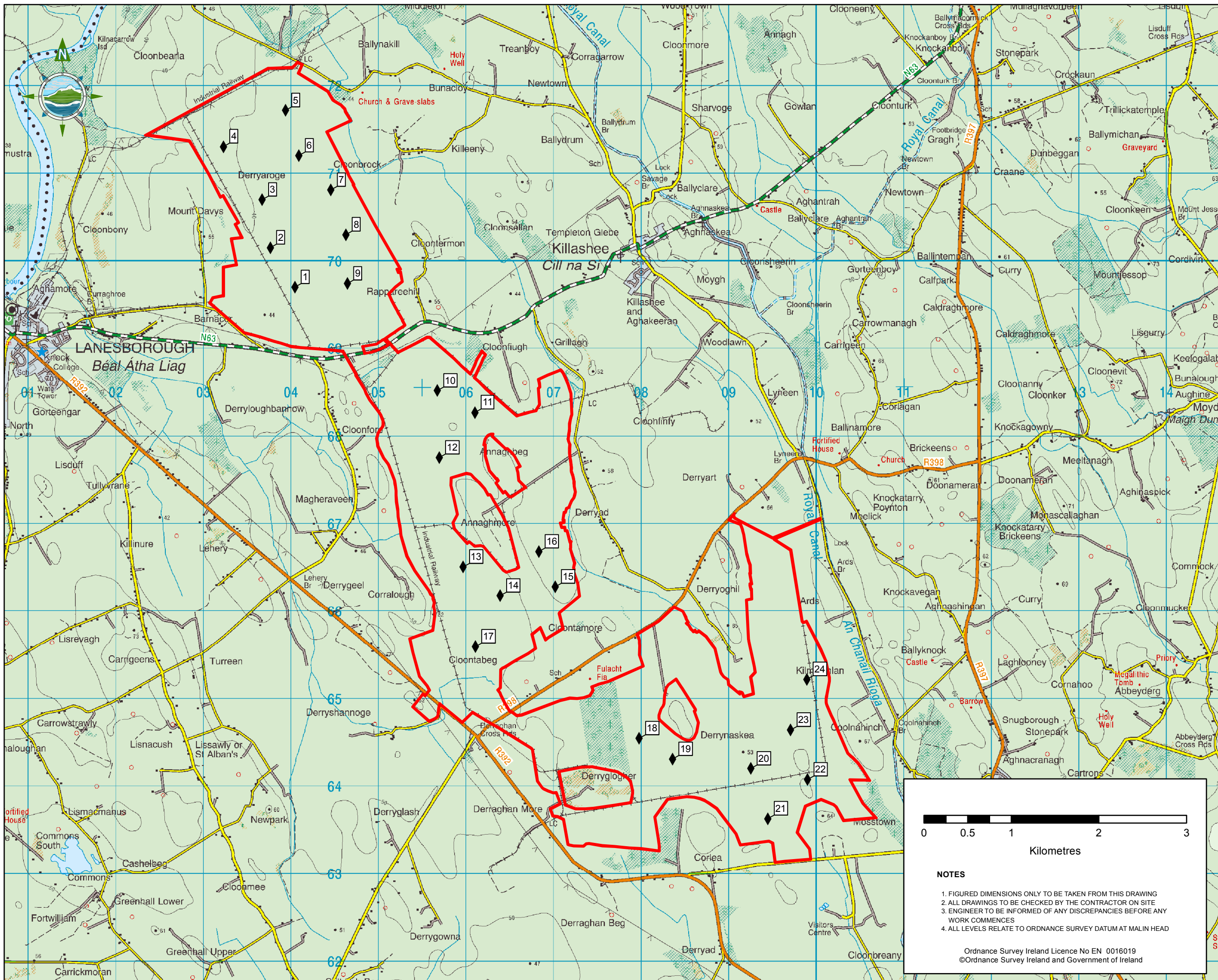
Title: **REGIONAL SITE LOCATION MAP**

Scale @ A3: 1:100,000
 Prepared by: M. Nolan
 Checked: S. Tinnelly
 Date: January 2019
 Project Director: D. Grehan

Drawing Status: Planning

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Drawing No.: **Figure 1.1** Revision: **A**



Legend

- Planning Application Boundary
- Proposed Turbine Locations

Issue	Date	Description	By	Chkd.
A	Jan 2019	Final Issue	FH	ST

Issue	Date	Description	By	Chkd.
A	Jan 2019	Final Issue	FH	ST

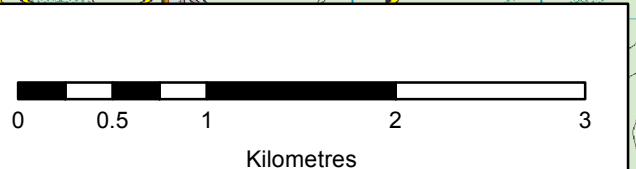
Client:
BORD NA MÓNA
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Project:
DERRYADD WIND FARM

Title:
Proposed Wind Turbine Locations

Scale @ A3: 1:40,000
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NOTES

- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
- ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
- ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
- ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

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2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

2.1.1 *The Proposed Site*

The proposed development, known as Derryadd Wind Farm (See Figures 1.1 and 1.2) is located within part of the Moundillon peat production bog group in Co. Longford.

The proposed wind farm site is located within the townlands of Cloonkeel, Ballynakill, Cloonbearla, Cloonbrock, Derryaroge, Mount Davys, Rappareehill, Cloonfore, Cloonfiugh, Barnacor(Ed Rathcline), Grillagh (Moydow By), Derryad (Moydow By), Annaghbeg, Annaghmore, Derryart, Derryoghil, Ards, Corralough, Cloontamore, Derrygeel, Cloontabeg, Kilmakinlan, Derrynaskea, Derryshannoge, Derraghan More, Coolnahinch (Moydow By), Derryglogher, Mosstown (Rathcline By), Corlea and Derraghan Beg, Lanesborough, Co. Longford.

The land use/activities on the site are a mixture of active peat extraction, peat extraction works (administration offices, machinery maintenance and storage, stores, canteen), bare cutaway peat, re-vegetation of bare peat, and two existing wind monitoring masts on Derryaroge Bog and Lough Bannow Bog. These works, aside from the wind monitoring masts, form part of the Bord na Móna Moundillon peat production facility in County Longford.

The proposed development is approximately 12km long in the northwest/southeast direction and is approximately 4km wide in an east/west direction. The site lies between the towns and villages of Lanesborough, Derraghan, Keenagh and Killashee while the main urban centre in the region is Longford Town. The site is approximately 2km east of Lanesborough, County Longford. Longford Town is approximately 9km north east of the wind farm location. The site has an area of approximately 1900 hectares and mainly lies directly to the east of the R392 which runs from Lanesborough in the north to Ballymahon in the south. Derryaroge Bog to the north is adjacent to the River Shannon and Lough Bannow Bog is immediately to the west of the Royal Canal which runs in a north south direction. Lough Ree is located approximately 5km to the west of Derryadd Bog.

The surrounding landscape is a mixture of forestry, agricultural land and cutaway peatland. The landscape is predominately flat. The most significant features in the surrounding landscape are 'Bawn Mountain' which is located approximately 8km to the east of Lough Bannow Bog and Sliabh Bawn located 8km to the northwest of the proposed development.

The significant energy infrastructure that exists in the local area is Lough Ree Power located to the west of Derryaroge Bog, and its associated grid infrastructure in the form of 110 kV pylons network (in particular the Lanesborough/Richmond and Lanesborough/Mullingar lines). Sliabh Bawn Wind Farm in County Roscommon is located approximately 8km northwest of the proposed development. The proposed development is predominately in a suitable area for wind energy development as outlined in the Longford County Development Plan 2015 – 2021.

There are also a number of Bord na Móna rail lines that pass through the bogs facilitating the transportation of milled peat and ash.

At a greater distance from the site is the Skrine Wind Farm, located approximately 19km to the south-west of proposed development, and the Roosky Wind Farm, located approximately 14.5km to the north of the proposed development.

In addition, the recently permitted refurbishment of the Cloon-Lanesboro 110 kV overhead line (Planning Ref, 18/139, Longford Co. Co.) includes a proposal to refurbish the existing overhead line located primarily in Counties Galway and Roscommon, with 120m of the line located in County Longford, in the vicinity of Lanesborough substation.

2.1.2 The Proposed Development

The planning application boundary is displayed as the “red line” boundary, in the planning drawings accompanying this EIAR. The total area of the planning application is approximately 1900 hectares.

The proposed development comprises the construction of 24 no. wind turbines and ancillary works. The turbines will have a maximum blade tip height of 185m above the top of the foundation level and will be accessible from internal access routes within the Bord na Móna site.

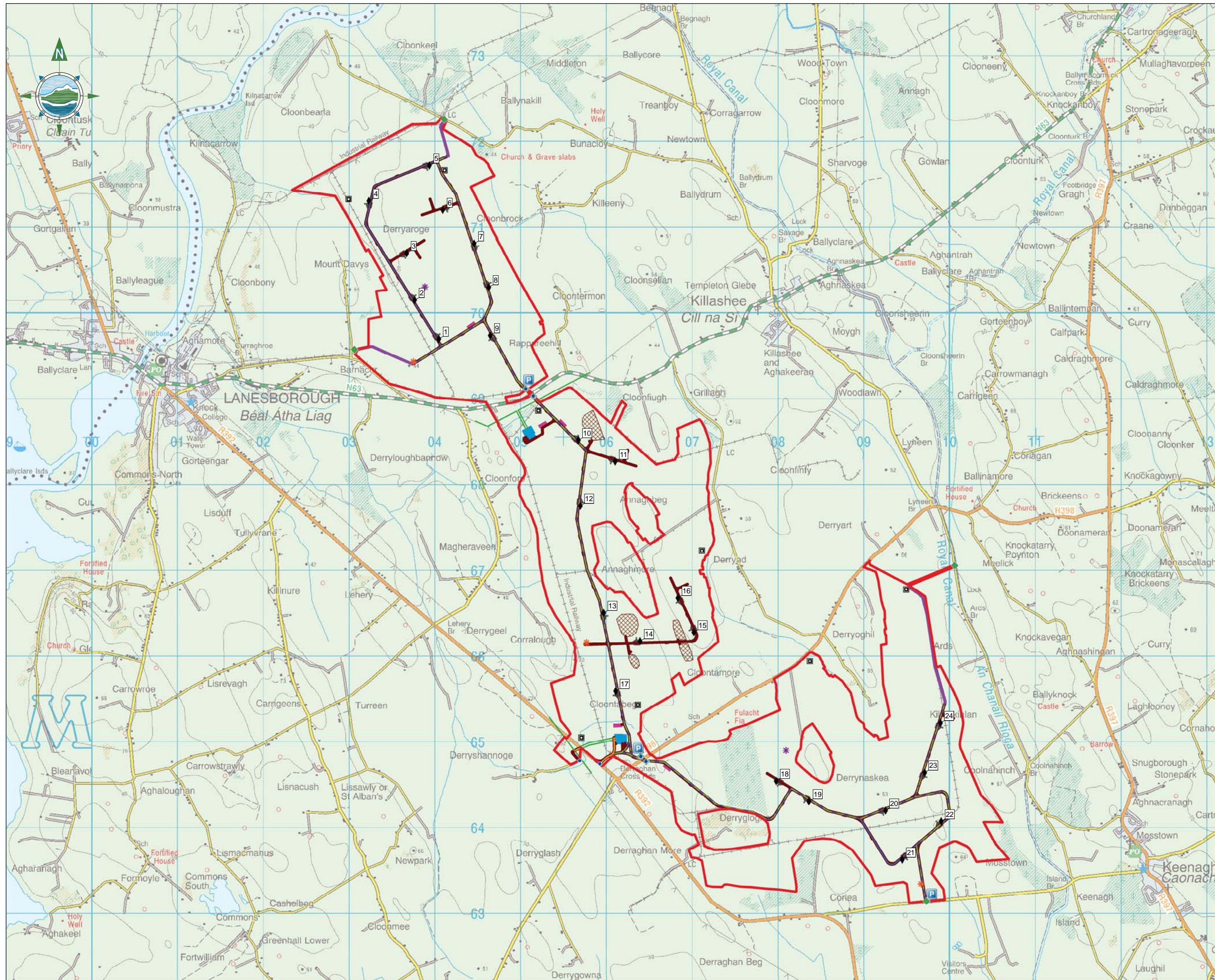
Bord na Móna intends to apply for a ten-year planning permission for the following:

- 24 no. wind turbines with an overall blade tip height of up to 185m and all associated hard-standing areas;
- 5 no. borrow pits;
- 3 No. permanent Anemometry Masts up to a height of 120m;
- Provision of new internal site access roads (permanent and temporary), passing bays, amenity cycleways, car parking and associated drainage;
- 1 no. 110kV electrical substation, including battery storage, which will be constructed at one of two proposed locations on site: either Option A in Cloonfore townland or Option B in Derraghan More townland. The electrical substation will have 2 no. control buildings,

associated electrical plant and equipment, battery storage containers and a wastewater holding tank;

- 5 no. temporary construction compounds, in the townlands of Cloonfore, Cloontabeg, Derraghan More, and Rappareehill (2 no.);
- All associated underground electrical and communications cabling connecting the wind turbines to the proposed substation at either Option A in Cloonfore or Option B in Derraghan More;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be either to the existing Lanesborough/Richmond 110 kV line via overhead line (Option A) or to the existing Lanesborough/Mullingar 110 kV line via an underground or overhead line (Option B);
- Removal of existing meteorological masts;
- New access junctions, improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and construction access, including locations on the N6, N61, N63, R392, R398, L11554, L1136 roads, access onto the local road in the townland of Cloonkeel, access onto the local road in the townland of Mount Davys and amenity access from the Royal Canal Tow Path (off the L5239);
- All related site works and ancillary development; and
- A 10-year planning permission and 30-year operational life from the date of commissioning of the entire wind farm.

The layout of the site is illustrated in Figure 2.1.



Legend

- Planning Application Boundary
- Proposed Substation Options
- Borrow Pit Locations
- Turbine Hardstand
- Temporary Construction Compounds
- P Amenity Car Park
- ◆ Proposed Turbine Locations
- ★ Proposed Met Mast Locations
- ★ Existing Met Mast Locations
- Construction & Operational Traffic Access
- ◆ Amenity Access
- Existing Surface Water Pumps
- Underground Cables
- Overhead Line
- Road Layout
- Cycleway / Walkway Only
- Cycleway
- Walkway

0 200 400 800 1,200 1,600
Metres

A	Jan. 2019	Final Issue	MN	ST
Issue	Date	Description	By	Chkd.

Client:
BORD NA MÓNA
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Project:
DERRYADD WIND FARM

Title:
SITE LAYOUT PLAN

Scale @ A1: **1:20,000**

Prepared by: M. Nolan Checked: S. Tinnelly Date: January 2019
 Project Director: D. Grehan

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Issue:
Figure 2.1 A

2.2 PROJECT CONSTRUCTION

2.2.1 *Development Components*

The proposed development will comprise of the following elements:

- Wind Turbines, which are further detailed in the EIAR as follows:
 - Turbine Locations (as shown in Figure 1.2)
 - Wind Turbine Specifications
 - Turbine Tower
 - Turbine Blades
 - Turbine Foundations
 - Hardstands
 - Assembly Area
 - Turbine Colour
 - Power Output
- Site Roads
- Borrow Pits
- Electricity Substation
- Battery Storage
- Substation Control Buildings
- Underground Cabling
- Grid Connection, further detailed in the EIAR as follows:
 - Overhead Line Connection (at either of two locations; Option A or Option B) or
 - Underground Cable Connection (at location Option B)
- Rural (Local) Electricity Supply
- Anemometry Masts
- Amenity Cycleway/Carparks.
- Construction, Operational and Amenity entrances

2.2.2 *Construction Schedule*

Approximately 100-120 persons will be employed during the peak construction period and it is estimated that the construction phase will take approximately 24 - 30 months from starting onsite to completion of commissioning of the turbines.

It is anticipated that the construction work will be sequenced as follows:

- 1) civil engineering works: approximately 18 months;
- 2) electrical works: approximately 18 months (will commence shortly after the civil works and will then run in parallel); and

3) turbine erection and commissioning: approximately 9 months.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs weekdays and between 7:00hrs and 13:00hrs on Saturdays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local Planning Authority.

2.2.3 Construction Methodologies

Chapter 2 of the EIAR details specific construction methodologies for the following elements of the proposed development:

- Temporary Compounds, hardstands, material storage areas and site offices;
- Turbine Foundations;
- Site Roads and Crane Pad Areas; and
- Grid Connection Options for Substation at either of two locations Option A or Option B.

The construction methodology associated with the grid connection for the proposed development also considers the potential for an underground cable or an overhead transmission line option.

If chosen as the preferred option, underground cables will be installed primarily within the site as indicated on the planning application drawings with the exception of where they will be laid in a short section of the public roadway. It should be noted that works within the public road will be subject to further consents/agreements with Longford County Council for example a Road Opening Licence etc. as appropriate.

The methodology for construction of a short section of overhead line will involve the following:

- Insertion of two angle masts in the existing overhead line;
- Construction of two end masts near the proposed station;
- Construction of additional angle masts where the route from the existing line to the station changes direction; and
- Construction of intermediate towers/polesets as necessary to achieve the design clearance of the line from the ground.

Whether an end mast, angle mast or cable interface mast is required the process of installation will generally require angle mast foundation, assembly and erection, poleset erection and stringing of conductors.

2.2.4 Construction and Environmental Management (CEMP)

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established.

A CEMP has been prepared for the proposed development and is included in Appendix 2.2 of the EIAR. It is intended that the CEMP would be updated prior to the commencement of the construction of the wind farm, to ensure that all mitigation measures, conditions and or alterations to the EIAR and application documents that may emerge during the course of the planning process are included. Following the update, the CEMP will be submitted to the Planning Authority for written approval.

The construction contractor will be responsible for implementing the mitigation measures specified in the EIAR (listed in chapter 17 Schedule of Mitigation) and CEMP and for communicating the requirements with all staff on-site. Their implementation of the mitigation measures will be overseen by the supervising Ecological Clerk of Works (ECoW), ecologists, archaeologists and/or geotechnical engineers, as appropriate.

2.2.5 Surface Water Management

The surface of the cutover bog is drained by a network of parallel northwest-southeast generally orientated field drains that are typically spaced every 15 - 20m. As a result, there is an existing surface water drainage system in operation at the location of the proposed development. Surface water runoff from the site will continue to be routed via settlement ponds (in accordance with the IPC licence requirements) prior to discharge into off-site drainage channels, streams and rivers which ultimately flow into the River Shannon.

2.2.6 Surface Water Monitoring during Construction

During the construction phase, all run-off from construction areas will be controlled and treated to reduce suspended solids concentration prior to being discharged into the existing drainage network. A number of temporary peat settlement ponds will be established during the construction phase along roadways and in areas of high construction activity to minimise silt laden run-off entering the drainage network. Those not required permanently shall be reinstated upon completion of the main construction works.

The surface water drainage system will require regular inspection during construction works and during operations to ensure that it is working optimally. Where issues arise, the works should be

stopped immediately and the source of potential impacts on the surface water quality investigated.

The management of surface water runoff and sediment control during the construction phase will be carried out in accordance with the Surface Water Management Plan contained within Appendix 8.4 of the EIAR.

2.2.7 Surface Water Monitoring during Operation

The surface water drainage system utilises sustainable drainage devices and methods where appropriate. The drainage layout for the operational stage of the proposed development has been designed to collect surface water run-off from roads, crane pads and hardstanding areas and is dispersed across the cutaway peatlands and will ultimately be assimilated into the existing drainage network within the boundary of the proposed development.

2.2.8 Road Construction

The proposed development will involve the construction of permanent roads, including Amenity Roads (founded/floating) and temporary floating roads. The details of the various road types are included in the Planning Application Drawings and in Chapter 2 of the EIAR.

2.2.9 Access and Transportation

As described in Chapter 14, Traffic and Transport, the successful completion of this project will require significant co-ordination and planning and a comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed development. Access will be through a mixture of existing and proposed entrances to the site. The traffic management plan proposed for the Derryadd Wind Farm is included in the CEMP, in Appendix 2.2.

Construction/Operational Site Entrances

There will be a total of six wind farm entrances used to transport materials and equipment to the site. All are existing entrances with the exception of the proposed large component and construction entrance that will be located on the Lanesborough to Ballymahon road (R392) to the west of the proposed substation (Option B) and an entrance into the Derryshannoge Bog to be located along a local road (L11554) that accesses the R392 north of Derraghan Village. The existing entrances that have been identified for the wind farm and are used presently for the machinery involved in the current peat harvesting activities are the following:

- Existing entrance to the Southern part of Derryaroge Bog, off the N63;
- Existing entrance to the Northern part of Derryadd Bog, off the N63;

- Existing entrance to the Southern part of Derryadd Bog, off the R398; and
- Existing entrance to the Northern part of Lough Bannow Bog, off the R398.

The main entrance for the proposed development is located along the R392 Ballymahon to Lanesborough road. This entrance will be the main construction entrance to the site and will facilitate both materials delivery to the site (stone, steel and concrete) as well as large oversize components such as turbine blades, tower sections and substation components. The Derryshannoge access off the L11554 will be used for the grid connection works only (associated with Substation Option B) and as such will have a comparably low level of traffic and associated material deliveries.

Amenity Site Entrances

There will be a number of site entrances designated as Amenity Site Entrances and these entrances will be located as shown on Figure 2.6 of the EIAR.

Turbine and Construction Materials Transport Routes

Turbine and Construction materials will be restricted to the following routes:

- Construction materials coming west from Longford along the N63 accessing the site through the southern entrance to Derryaroge and the northern entrance to Derryadd;
- Construction materials coming from Lanesborough access the site either along the N63, R392 or R398 and the site entrances along those roads; and
- Turbine and oversized loads access the site from Lanesborough going south along the R392 accessing the site through the entrance on that road.
- Construction materials from Ballymahon going north to the site along the R392 accessing the site at the entrance along this road to Derryadd or the entrances along the R398 to Derryadd or Lough Bannow;
- A limited amount of construction materials such as steel, stone and concrete will access the Derryshannoge Bog using the L11554 entrance. These materials will either be transported north from Ballymahon or south from Lanesborough along the R392.

2.2.10 Dust Suppression

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

2.2.11 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice and to avoid the potential for the transfer of alien invasive plant species into the site, it is proposed to install a self-contained wheelwash system at the project site. A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

2.2.12 Waste Management

Any wastes generated by the construction and operation of the wind farm will be collected, taken off site and reused, recycled or disposed of at authorised facilities, according to best practice and legislative requirements.

The management of all construction wastes will be carried out in accordance with the construction waste management plan contained within the CEMP, Appendix 2.2 of the EIAR.

2.2.13 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

2.2.14 Refuelling

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

On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axle custom-built refuelling trailer, will be re-filled off site or at the

contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use.

2.3 OPERATION AND MAINTENANCE

The proposed wind farm development is expected to have a lifespan of 30 years. During this period, on a day-to-day basis, the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to a control centre. Each turbine will also be monitored by the wind turbine supplier or Operations and Maintenance (O&M) service provider. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at a control centre 24-hours per day. Routine inspection and preventive maintenance visits will be necessary to ensure the smooth and efficient running of the wind farm.

2.4 COMMUNITY BENEFIT PROPOSAL

Bord na Móna presently operate two wind farm community gain schemes at its wind farms in Mountlucas and Bruckana. These schemes were established in 2014 thanks to the help and cooperation of the communities surrounding the wind farms. The Community Gain Schemes for Bruckana and Mountlucas Wind Farms were set up on the basis of community involvement and public consultation. The Community Gain Scheme consists of a fixed level of funding (based on the installed capacity of the wind farm) that is made available each calendar year for community led projects in the local area. During 2017 and 2018, a 'near neighbour' scheme was established for residents in the vicinity of the Bruckana and Mountlucas wind farms. The near neighbour schemes offer electricity bill payers living within a prescribed distance of a wind turbine an annual contribution towards their electricity usage. In addition to the electricity contribution payment, the Scheme will also offer participants a contribution towards the completion of energy measures on the property and/or education support. The estimated direct benefit to the local community arising from the combined community benefit and near neighbour schemes is a total of approximately 8.1 million euro over a 30 year period. A detailed description of the Community Benefit proposal is outlined in the 'Community Report for the Derryadd Windfarm' in Appendix 1.3 of the EIAR.

2.5 DECOMMISSIONING

As stated previously the wind turbines proposed as part of the proposed development are expected to have a lifespan of 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation.

The on-site substation will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned.

2.6 HEALTH AND SAFETY

The proposed Derryadd Wind Farm will be designed, constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Acts 2005 to 2014;
- Safety, Health and Welfare at Work (General Application) Regulations;
- Safety, Health and Welfare at Work (Construction) Regulations 2013; and
- Safety, Health and Welfare at Work (Work at Height) Regulations 2006.

Aspects of the development that will present health and safety issues include:

- Health and safety aspects of construction activities;
- General construction site safety (e.g. slip/trip, moving vehicles etc);
- On site traffic safety (during construction and operational phases) associated with high road embankments;
- Traffic safety during the transport of oversized loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and
- Working with electricity during commissioning.

3 REASONABLE ALTERNATIVES

3.1 INTRODUCTION

To find the most suitable site for the proposed development, Bord na Móna considered a number of factors, as recommended in the Draft EPA Guidelines (EPA, 2017).

Alternatives to the proposed development, in terms of layout and design, were considered under the following headings:

- 'Do Nothing' Alternative;
- Alternative Locations;
- Alternative Layouts/Design;
- Alternative Processes;
- Alternative Mitigation Measures; and
- Consultation about the consideration of the alternatives.

3.1.1 *'Do Nothing' Alternative*

An alternative to developing a wind farm at the proposed development site would be to leave the site as it is, once peat extraction ceases. The date of cessation of peat extraction is primarily dependent on the continued use of milled peat as a fuel in the Lanesborough Power station. Peat extraction has already ceased on parts of the site and will reduce on an increasing area year on year. When peat extraction ceases, a Site Rehabilitation Plan will be implemented in accordance with the IPC licence requirements, to encourage re-vegetation of bare peat areas, with targeted active management being used to enhance re-vegetation and the creation of small wetland areas (if required).

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of County Longford's renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment, a development contribution, rates and investment would also be lost. Also, the proposed amenity access points and associated carparks would not be constructed as part of the rehabilitation and, therefore, this recreational opportunity would be lost as well as the proposed connectivity with Lanesborough, the Royal Canal and Corlea Trackway. On the basis of the positive environmental effects arising from the project, the do-nothing scenario was not the chosen option.

3.1.2 *Alternative Locations*

Bord na Móna owns circa 80,000 hectares of land, primarily in the Midlands of Ireland. An assessment of potential future uses of this landbank was published by Bord na Móna in 2011 in a document entitled '*Strategic Framework for the Future Use of Peatlands*'. This report clearly identified the potential for the development of renewable energy (in particular Wind Energy) and other developments on Bord na Móna lands.

The Project Ireland 2040 National Planning Framework identifies a range of Key future planning and development and place-making policy priorities for the Eastern and Midland Region that includes

'Harnessing the potential of the region in renewable energy terms across the technological spectrum from wind and solar to biomass and, where applicable, wave energy, focusing in particular on the extensive tracts of publicly owned peat extraction areas in order to enable a managed transition of the local economies of such areas in gaining the economic benefits of greener energy.'

Consequently, when considering suitable locations for the proposed development, the assessment was confined to lands within the Bord na Móna landholding only as these lands have been identified in a regional context as being suitable for this type of development. An examination of sites outside of the landholding was not included as part of the process.

The assessment carried out for the determination of a suitable location for the proposed development was a two-stage process. The first stage comprised the identification of a number of candidate sites while the second phase comprised a site-specific assessment.

Over twenty sites were identified as having a higher potential for wind energy development and were then brought forward for the site-specific assessment. A weighted score was awarded to each site under a list of selection criteria. Higher weightings were given to key criteria such as environmental sensitivity, grid access/capacity, county development plans/zoning and proximity to houses. The scores for each site were totalled following the assessment to determine the most suitable site for the proposed wind energy development.

Following the site-specific assessment process carried out in late 2015, the site proposed for the Derryadd Wind Farm development emerged as the preferred location.

3.1.3 *Alternative Layouts/Design*

During the EIAR stage, the study area was surveyed in detail to establish the baseline environment. All site constraints were identified and updated as further detailed assessment was undertaken.

The site layout design stage considered the size, number and positioning of turbines and layout of associated site infrastructure i.e. internal roads, temporary construction compounds, met masts, substations, borrow pits etc., relative to the identified constraints. Alternatives considered for each of these elements are documented in the EIAR and include:

- Turbine Layouts and Alternative Turbine Configurations;
- Site Entrances;
- Internal Access Roads;
- Substation Locations and Grid Connection;
- Borrow Pits; and
- Proposed Derryadd Wind Farm Amenity Plan (Access Points and Internal Loops).

It was an iterative process comprising input from the design team, environmental specialists, internal and external stakeholders. As an iterative process, environmental effects were reduced or eliminated through changes to the design, where possible. The alternative designs considered for the Derryadd Wind Farm are illustrated in Figure 3.1 and Figure 3.2 of the EIAR.

3.1.4 *Alternative Processes*

Alternative Land-Uses

As peat production ceases over the coming years, Bord na Móna will be presented with the opportunity to allow or facilitate new landscapes to develop. Research work, mainly in the form of demonstration projects, has been ongoing since the 1970's. The research and demonstration projects informed the understanding of the nature of industrial peatlands and facilitated the development of a knowledge base that has been built up over decades. The alternative uses that have been examined over that timeframe include renewable energy (in particular, wind energy), biomass, coniferous forestry, horticulture, grassland, cereal growing, growth of cranberries and blueberries, biodiversity/ecosystem services and amenity/tourism related after uses.

Wind farm development on Bord na Móna lands commenced in 1992 with the construction and operation of the Bellacorick Wind Farm, Co. Mayo. Since then two additional wind farms were constructed and became fully operational in 2015 at Bruckana and Mountlucas. Construction has also commenced on a fourth wind farm at Oweninny in County Mayo and planning consent has been secured for a fifth at Cloncreen, Co. Offaly. This alternative use of cutaway peatlands has been clearly demonstrated to be successful and have a low level of environmental effects.

Short rotation forestry trials carried out in the 1970's directly on cutaway bog, without intrusive conversion of the growing medium, did not survive and died out within a few years. Further trials in 2005 on well prepared cutaway failed to provide the necessary yield to make the growing of willow biomass viable. The yield was less than 20% of the yield attainable on good arable land.

Afforestation was initially envisaged as the most favourable commercial option for the after-use of post-production peatlands. Trials on this particular use date back to 1955. The initial trials were favourable; however, the growing performance was poor.

Further studies were carried out on the potential for the growth of field vegetables, grassland, cereals, cranberries, blueberries, with no notable success that could be transferred to the proposed development site. More recent developing possibilities include aquaculture and solar energy.

However, notwithstanding the range of uses considered and explored by Bord na Móna over its lands, the proposal to develop a wind farm at Derryadd has been identified as the most appropriate and sustainable use of the cutaway bog at the proposed site. This proposal coupled with the potential for a tourism and amenity facility at the development site illustrates that the after use of cutaway peatlands may comprise more than one use and may also facilitate additional developments.

Alternative Sources of Energy

Currently, most of Ireland's energy is produced using fossil fuels such as gas, oil, coal and peat. The large-scale use of carbon intensive fossil fuel releases large quantities of carbon dioxide (CO²) and other pollutants into the atmosphere, which contribute to the process of climate change and other detrimental health and environmental effects.

When considering wind energy as an energy source, it is important to place its development in an international, national and local policy context from the perspectives of environment, energy and planning. Numerous legislative mechanisms and requirements from a global to local level have been formulated to support the generation of energy from renewable sources and reduce the dependency on fossil fuels.

The primary alternative is to continue to generate electricity using finite, fossil fuel resources. This will further contribute to greenhouse gas and other emissions and hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

Bord na Móna is continuing to diversify its portfolio of renewable energy assets as it transitions from the harvesting and combustion of peat. This transition is evident across the land bank and will progress with the potential development of additional wind farms, solar farms, increased use of Biomass in the co-firing with peat, landfill gas, biogas and battery storage. A key input to ensuring a successful and sustainable transition is the selection of the correct technology for the correct site. These alternative technologies for production of renewable energy were considered for the proposed development location but the use of wind energy technology on this particular site produces the lowest level of environmental effects.

3.1.5 Alternative Mitigation Measures

The mitigation measures proposed in relation to the elements of the project are detailed in the chapters to follow and are also summarised in Chapter 17 - Schedule of Mitigation Measures. The mitigation measures proposed are considered to be proven and best practice. The level of mitigation proposed is determined to be proportionate to the potential impact. On this basis, the chosen mitigation measures are those that are considered to have the least environmental effects.

3.1.6 Consultation about the consideration of the alternatives.

Details of the consultations held in respect of the proposed development are summarised in Chapter 1 of the Non-Technical Summary and listed in Chapter 1 of the EIAR. All meetings, public consultations and submissions received to date have been reviewed and incorporated into the design and layout process, as appropriate.

4 POLICY, PLANNING AND DEVELOPMENT CONTEXT

The planning history, the planning and development context and the planning need of the proposed Derryadd Wind Farm development has been investigated.

Relevant policy has been reviewed at an international (UN and EU), national, regional and local level. The proposed wind farm development is consistent with the current energy and planning policy context, which seeks to increase the share of electricity generation from renewable sources and locate wind energy developments in suitable locations, thereby minimising any environmental impacts. There is a specific recognition of the importance of on-shore wind farms in achieving these objectives. The proposal will contribute to national and international efforts to reduce carbon emissions to the atmosphere and thereby help to address concerns regarding climate change.

Policies and objectives also support the location of such facilities on developed peat bog sites. The proposal is within such a location; a working Bord na Móna peat bog that has been used mainly to supply fuel to the nearby Lough Ree power station. Furthermore, the local adopted County Development Plan for County Longford, identifies preferred areas for wind farm development. The site is mainly within such an area.

The proposed wind farm will add to Ireland's overall renewable energy generating capacity. Due to the scale of the proposal, the project is of strategic economic and social importance to the Region and the State. The capital investment will represent a significant economic contribution to the Region and the State as a whole. The project will assist in meeting national renewable energy targets and will also result in significant reductions in carbon emissions from electricity generation and reduce the reliance on imported fossil fuels and will assist in the transition from the dependency on fossil fuels to energy generation from renewable sources.

Some types of development are referred to as Strategic Infrastructure Development (SID) under the planning legislation. Depending on some other factors, these include:

An installation for the harnessing of wind power for energy production (a wind farm) with more than 25 turbines or having a total output greater than 50 megawatts.

An Bord Pleanála has already determined that this project fits into such a category. Therefore, this planning application will be made to An Bord Pleanála, rather than to the local authority.

A review has taken place of adjoining wind farm developments as well as of other developments in the immediate vicinity of the site. This allows an assessment of cumulative impacts arising from this and other proposals. Four wind farm developments were identified:

- 20 no. turbines at Sliabh Bawn, Strokestown, County Roscommon;
- 2 no. turbines at Skrine, Athleague; and
- 2 No. Turbines at Ballaghaderreen, County Roscommon (Roosky Wind Farm).

It is also noted that there have been grants of planning permission for two solar farm developments in the vicinity of the site.

- A grant of planning permission for a solar farm at Middleton, Ballycore, Treanboy and Newtown, near the village of Killashee, Co. Longford.
- A grant of planning for a solar farm at Fisherstown, Clondra, Co. Longford.

There is a considerable economic benefit to the development of wind farms in job creation, investment and energy production. In this particular case, approximately 100-120 jobs will be supported during the construction phase and between 6-8 jobs during the operational phase. The construction of the wind farm would have a capital cost in the region of 100 million euro and an estimated 20 to 30 million euro of the total cost relating to site works which will require the services of local contractors and suppliers. The estimated direct benefit to the local community arising from the combined community benefit and near neighbour schemes is a total of approximately 8.1 million euro over a 30-year period. Furthermore, significant annual rate payments will be made to Longford County council during the operation of the wind farm.

The proposal is considered to be in compliance with land use and energy policies and objectives at international, national, regional and local level.

5 POPULATION AND HUMAN HEALTH

5.1 INTRODUCTION

This chapter summarises the existing environment and addresses the potential effects on population and human health arising from the proposed development. Mitigation measures will be proposed to mitigate any potential effects arising from this proposed development.

5.2 EXISTING ENVIRONMENT -POPULATION

The proposed wind farm development will be located on four bogs within the Mounddillon peat production group in south County Longford. The current land use and activities on the site are a mixture of active peat extraction and associated works. There are a number of scattered domestic dwellings and farm buildings surrounding the study area, along with some linear settlement on the N63 and local roads.

The proposed development will be located within the jurisdiction of Longford County Council. The population change in the county and study area over the period 2006-2016 increased in all areas with the exception of Cashel East ED. The closest confirmed dwelling to a turbine is located in excess of 750m from the nearest turbine. Forum meetings, public clinics and house to house visits have occurred as part of the public engagement for this project with all residences within a 2km area of the boundary of the site,

The Labour Force Survey undertaken by the Central Statistics Office (CSO) shows the unemployment rate for the State in Q3 2018 was 6.0% while the unemployment rate for the Midlands Region was 7.1%. Over the period October 2017 – October 2018 there was a 15.7% decrease in the number of persons on the live register in the State as a whole and an 18.0% decrease in the number of persons on the live register in the Midlands Region. Despite a decrease in live register figures the overall trend indicates a need for further employment in the Midlands Region including County Longford.

In relation to tourism, Fáilte Ireland overseas visitor figures from 2017 show that Longford was the least visited county in Ireland with just 24,000 tourists. Those numbers are however expected to rise following the launch of a new tourism brand 'Ireland's Hidden Heartlands' and Ireland's first Centre Parc Resort opening in Longford in 2019.

Fáilte Ireland identifies the top fee paying and free attractions in Ireland each year. None of these attractions are located in proximity to the proposed development. The Longford County Development Plan 2015-2021 highlights several flagship tourist attractions for County Longford including the Corlea

Trackway Centre, and the adjoining Royal Canal; the Mid Shannon Wilderness Park; Lough Ree; The River Shannon; Inchcleraun or Quaker Island that is home to the ruins of St Diarmaid's Monastery (a National Monument), the ruins of an Augustinian Monastery on Saints Island again in Lough Ree, the Abbeyderg Monastery near the settlement of Keenagh etc. The planned Center Parcs 'Longford Forest' resort which will be located approximately 12km southeast of the proposed Derryadd Wind Farm site boundary will be one of the largest single tourism investments ever made in Ireland. As such it will firmly place County Longford front and centre of future tourism promotional and marketing campaigns.

No known public rights of way or cycling routes will be severed by or are located in proximity to the proposed development. Similarly, no angling locations or golf courses are present on or proximal to the proposed development site. There are no existing equestrian routes on the proposed development site. The ISPCA National Animal Centre at Derryglogher is located approximately 780m to the west of the nearest turbine (T18) within Lough Bannow Bog. Lockside Farm and Stables (approximately 1.5km) and Mosstown Stables (approximately 1km) are both located south east of the study area.

The potential community gain as a result of the proposed development is described in detail in Chapter 2 Volume II of the Environmental Impact Assessment Report.

5.3 EXISTING ENVIRONMENT - HUMAN HEALTH

Whilst specific health data for individuals in the vicinity of the proposed windfarm is confidential and difficult to establish, as has been detailed in the methodology section (Section 5.3.1 of the EIAR), a community profile has been used to establish a baseline and identify unequal distributions in existing factors such as deprivation or burden of poor health, in order that changes in community exposure to certain health pathways and their degree of impact on the population or community can be assessed.

There are separate health profiles available for all local authority areas. The most recent profiles published relate to 2015 (Lenus, 2015) and have been used to establish a community health profile for the proposed windfarm. The key facts in the Health Profile relating to County Longford are detailed in Volume II. Whilst it is not possible to get reliable baseline information on small scale populations the data available, recognising its limitations, nevertheless does give a valuable insight into the general area.

5.4 POTENTIAL IMPACTS -POPULATION

Construction

The change to land use during the construction phase will have an imperceptible negative indirect effect on the local population and construction works will be short term in nature, expecting to take between 24-30 months. There may potentially be an increase in visitors (i.e. construction workers etc.) staying

in temporary accommodation in the area and adding value to the local economy which will be a positive direct effect during construction. Approximately 100-120 persons will be directly employed during the peak construction period. The construction phase of the proposed development will have a short-term slight positive effect on employment in the local area and Midlands Region through the creation of new jobs and support of existing jobs and services.

During the construction phase the main potential indirect effects on dwelling houses and the local population will include increased traffic levels, noise and visual effects resulting in a likely slight negative effect on the local population which will be short term in nature (24-30 months).

The proposed Derryadd Wind Farm development site is not currently open to the public and there are no tourist attractions or amenities (including walking/cycling trails, angling facilities, golf courses or equestrian activities) on site. This will remain the case during the construction phase and therefore have a neutral effect.

Operation

The land use will change to accommodate the proposed Derryadd Wind Farm development. The proposed development will also see approximately 30km of permanent roads put in place as the land is opened up for use by the public for walking, cycling, running etc. This will be a positive moderate permanent direct effect to the land use.

Whether or not wind farms have any effect on property values has been debated for many years. Based on the results of available published studies it is likely that the proposed Derryadd Wind Farm will not significantly impact on property values in the area. The proposed development has also been designed to ensure that there are no undue or adverse effects on the local or wider population and is not expected to affect local population numbers, but it may help attract tourists and temporary visitors to the area as the site is opened up for public access and linked to other attractions in the region. This would have a slight positive permanent effect to the area.

Local expenditure from operational activities will include employment (estimated as between 6 – 8 people), ongoing purchases of local materials, services and equipment as necessary. The project will also improve conditions for socio-economic growth by improving the power supply capacity and infrastructure in the local region potentially making the area more attractive to inward investment, further aiding rural development. While the direct effects from the proposed development locally will be limited, positive economic effects will be felt elsewhere in the area due to the substantial initial investment and ongoing generation of electricity providing a sustainable source and an increasingly competitive, low impact, energy supply to the county's domestic and industrial consumers. This is a significant, positive permanent direct effect for electricity consumers.

The proposed development includes for the provision of amenity infrastructure in the form of cycle and walkways throughout the site to connect with neighbouring villages and form part of the Royal Canal Greenway which will be available for public use. Bord na Móna will continue to work with local communities and authorities regarding Corlea Archaeological and Biodiversity Project; the Mid Shannon Wilderness Park and the Mid Shannon Tourist Trail in parallel with the development of the proposed Wind Farm. This has the potential to have a positive, permanent indirect and direct effect for the area and tourists.

The proposed wind farm development when operational will provide energy from a renewable resource and will not contribute to air pollution. In turn the wind farm will help reduce CO₂ and other greenhouse gas emissions by providing an alternative to the generation of energy through the burning of fossil fuels and will aid in achieving Irelands targets for renewable energy. When operational the wind farm will generate enough electricity to supply the needs of approximately 56,440 homes.¹ The proposed development will have positive long-term direct effect for Ireland.

The payment of a development contribution to Longford County Council and annual rates will provide benefits to the local community through refurbishment and upgrading of roads, carparks, sewers, waste water facilities, drains or watermains, community facilities, open spaces, landscaping etc. This will have a local slight, positive long-term indirect effect on the population.

The annual fund of the Community Gain Scheme will be related to the total installed MW of the wind farm and the arising MW/hr output. This scheme will have a local positive long-term effect for the community groups and projects involved. An element of the Near Neighbour Scheme will see local residences (within a set distance of a turbine) benefit from an annual contribution towards their electricity usage and will result in a positive long-term effect for these residences.

5.5 POTENTIAL IMPACTS -HUMAN HEALTH

When performing an assessment of the potential for health effects from a large-scale infrastructural project, it is important to conduct a review of all relevant literature on the subject. It is also important to assess the quality of any information reviewed. In general, studies which are published in peer-reviewed journals are the most authoritative. It is not possible to study all effects with this method so sometimes other methods such as a case-control study which may be retrospective are the best available. In general, the principles remain the same.

¹ Over 56,440 homes 96MW grid capacity, based on wind farm capacity factor of 30, and an annual average domestic energy consumption of 4,470kWh/y (Sustainable Energy Authority of Ireland, 2016)

In the detailed review presented in Section 5.3.3 of the EIAR, the sources of the relevant opinions and their scientific reliability are described in detail. The review presented deals with the following health related topics, which are considered relevant to wind farms:

- Wind Turbine Syndrome”
- Noise Induced Hearing Loss
- Sleep Disturbance
- Infra-sound
- Electromagnetic Interference (EMI)
- Air Quality/ Dust Emissions
- Shadow Flicker
- Psychological Effects
- Noise and Vibration
- Vibration
- Potential Health Benefits
- Health Improvement
- General amenity

For each of the above topics, an opinion is provided as to the potential impacts resulting from the proposed Derryadd Wind Farm.

5.6 MITIGATION MEASURES

The land use at the proposed Derryadd Wind Farm will change from its current land use but no mitigation measures are required from a population perspective as population numbers of the area are not expected to change as a result of the proposed development. From an economic perspective, the proposed development will provide employment opportunities to the local community during the construction phase, and ongoing sustainable income for the maintenance and operation team and the developer involved. It will also support employment in the wider region through the purchase of supplies and materials. As the expected result is positive, no mitigation measures are required.

The proposed development area will be opened for public access including the construction of walkways and cycleways. It is also proposed to link the area with neighbouring tourist attractions bringing more visitors to the area and Longford County. The resultant impacts on tourism and amenity are expected to be positive and no mitigation measures are therefore required. Annual rates paid by the developer and the establishment of a community gain scheme will have a positive impact within the locality and as such no mitigation measures are required.

5.7 RESIDUAL IMPACTS

The proposed wind farm development will provide energy from a renewable resource and help to achieve national energy and climate change policies. This is a direct positive residual effect for Ireland.

In terms of population the residual effects are expected to be positive particularly in terms of local economy, tourism and amenity. The proposed Derryadd Wind Farm is unlikely to have any significant negative effects on the local or broader population following the implementation of the mitigation measures. The establishment of a Community Gain Scheme is considered to be a positive effect for the local community in general. This in turn would have a positive effect on the individuals living in this community and a positive effect on their individual psychological health.

There is currently no credible evidence to link wind turbines to adverse health impacts. Any community will have vulnerable individuals. When limits are set be it for noise or dust it is to protect the most vulnerable rather than the robust, as long as the limits are met individuals and communities are protected. The predicted emissions are within these standards and so we can be confident that there will be no significant adverse effects on health, even amongst the vulnerable.

Overall, we can be confident that there will be no significant adverse human health effects on the population and there are some health benefits from the proposed development.

6 BIODIVERSITY

6.1 INTRODUCTION

The proposed development site is situated within a Bord na Móna landholding in the Irish Midlands, east of the River Shannon and northeast of Lough Ree. An ecological impact assessment on the biodiversity associated with the site, including an assessment of cumulative impacts was undertaken on the local biodiversity, including but not limited to habitats and protected terrestrial fauna and birds. An assessment of the potential effects on the integrity of European sites and their qualifying interests was undertaken and is presented within a Natura Impact Statement, submitted as part of the planning application.

6.2 EXISTING ENVIRONMENT

The site hosts three distinct bog units, each of which have been subjected to commercial peat extraction in the past or is currently ongoing. The largest sections of active peat production can be found in Derryaroge and Lough Bannow bogs. Seventeen habitats were recorded from the site including peatland, scrub, woodland, wetlands, grassland and built land. Overall the site varies greatly from areas which were not significantly impacted by the peat extraction activity, areas that are undergoing re-vegetation since they have come out of production, to areas of bare peat which are still being harvested. In general, the areas in which peat extraction has halted contain habitats typical of recolonising cutover bog with heath/scrub/woodland habitats on the relatively well drained portions of the proposed development site.

The majority of waterbodies within the site are artificial in origin, designed to drain the peatland for extraction. Scrub and bog woodland are scattered throughout the site and are mainly associated with recolonising cutaway bog habitats and their margins. A large block of bog woodland was found in the eastern corner of Lough Bannow Bog, fringing Lough Bawn proposed Natural Heritage Area.

The potential for birds to collide with turbines is one of the main impacts considered in the assessment of potential impacts during the operation phase of the wind farm. Detailed surveys of breeding and wintering birds in the proposed development area were undertaken to inform the ecological impact evaluation. Overall the level of site usage by species of high conservation concern was found to be low, with the majority of observations related to individuals commuting over the site. In general, the species composition and assemblages are typical of habitats found on cutaway bogs in the Midlands of Ireland.

Field evidence of protected terrestrial species, including bats was recorded onsite. Otter evidence indicated that watercourses and drainage ditches associated with the site are used by otters for

commuting, with no evidence of breeding or resting places found. Similarly, no badger setts were found during field surveys, however footprints were noted at all three bogs. The larval webs of Marsh fritillary (*Euphydryas aurinia*), a protected butterfly, were recorded within the site.

6.3 POTENTIAL IMPACTS

Potential impacts assessed included those relating to the life-time of the project including the construction, operation and decommissioning phases. No turbine locations are proposed in high value (local) habitats and all are located in habitats not evaluated as key ecological receptors, typically of low ecological value. Of the approximately 1,900 ha total area within the planning/ development boundary, the turbine hard standing areas, substations, associated infrastructure, compounds and internal roads combine for a permanent loss of approximately 51.8 ha or 2.7% of the total area. The proposed development is not likely to have a significant effect on water quality given the very localised scale of works and the distance these works are located away from rivers.

The two potential effects to avian communities within the vicinity of the proposed development area include habitat loss and fragmentation and disturbance displacement. Overall the significance of habitat loss and fragmentation to bird communities were evaluated as be of very low to medium significance with slight to moderate negative permanent effects. The significance of disturbance displacement was of very low to medium significance on the short-term with slight to moderate negative effects.

The total area of 'bat habitat' was assessed as covering approximately 435 ha. The length of the internal haul roads that traverse 'bat habitat' is 9km. Therefore, it is estimated that 1.24% of 'bat habitat' will be cleared to facilitate haul roads, as per Derryadd Wind Farm Bat Survey Report. The clearance of potential bat habitat at turbine locations also has potential to result in negligible to high impacts on local bat populations during the construction phase.

Noise associated with construction works and traffic activity may disturb resident mammals. However, in most cases, mammals within the development area are thought to be sufficiently mobile so as to temporarily relocate from works areas. Habitat loss is not considered to be of high concern for terrestrial mammals within the proposed development area; given that the internal roads, substation, associated infrastructure and turbine hard standing area constitutes a small proportion (c. 51.8 ha/ 2.7%) of the total proposed development area and the availability of similar suitable habitats in the surroundings (e.g. bog/ heath/ grassland/ scrub), the magnitude of the impact is judged to be a permanent slight negative effect.

Lough Bawn pNHA potentially contains suitable habitat for Desmoulin's whorl snail (*Vertigo moulinsiana*), however the proposed development infrastructure is not located within this pNHA and it is considered that the drainage regime proposed at the site is designed in such a manner as to have no

significant impact. No significant impacts to Marsh Fritillary population are envisaged as none of the identified larval sites will be affected by the proposed development footprint.

Consideration was given to potential cumulative impacts on avian fauna including cumulative collision risks, cumulative habitat loss and disturbance displacement effects and barrier effects and each were assessed as being of low concern. The potential impacts resulting from cumulative loss of habitat to mammals was considered insufficient to result in significant negative effects (in the overall context of total available habitat locally). Bat species (particularly Leislars) were noted to be susceptible to cumulative impacts which, if unmitigated, could be of local significance.

6.4 MITIGATION MEASURES

Mitigation by avoidance will offset potential significant habitat loss impacts for key avian species. Where areas of potentially sensitive breeding bird habitat (e.g. birch scrub) is proposed to be removed during construction, these works will be timed to avoid the breeding birds nesting season, 1st of March to 31st of August. In order to avoid a potential barrier effect on birds as a result of the positioning of the proposed turbines close together, the turbines have been positioned at distances greater than 400m apart. The turbine locations and access routes will avoid potential breeding sites that protected mammals such as otter, badger and bats typically use including; field boundaries (treelines / hedgerows), stream/ rivers and associated riparian habitats, old buildings, caves, bridges and souterrains.

A zone of 50m around the wind turbines (from the tip of the blade) should be cleared of tall vegetation (shrubs, trees, scrub etc.) to reduce favourability of this zone for foraging and commuting bats. Bat mitigation measures during the operational phase will be determined by implementing a strict surveillance programme for the first two years of operation of the proposed development in order to identify if a substantial risk exists at a particular turbine location or during a particular time-period. If surveillance results indicate medium to high bat activity levels and/or bat carcasses are collected, then bat mitigation measures for cut-in speeds will be required at specific turbine locations. For birds, bats, otter and badger, pre-construction surveys are proposed to inform site clearance activities. Post construction monitoring will be undertaken for bats over the lifetime of the project with visits undertaken in years 1, 2, 10 and 20. The development and implementation of a Construction Environmental Management Plan, which will include monitoring of construction by an Ecological Clerk of Works, is a key instrument in ensuring the implementation of all mitigation measures during construction.

6.5 RESIDUAL IMPACTS

Impacts in relation to habitat loss and fragmentation, disturbance, collision risk and cumulative effects have been assessed as slight to moderate negative effects (EPA 2017). The successful implementation of mitigation measures will render residual long-term impacts on key ecological receptors as slight negative effects (EPA 2017). The proposed development will, therefore, not have any significant effects on the flora, fauna and habitats considered as part of this biodiversity assessment.

7 LAND, SOILS AND GEOLOGY

7.1 INTRODUCTION

This chapter provides a summary of the existing soil and geological environment (i.e. baseline for the site) and potential effects of the proposed development. An outline of recommended mitigation measures and any residual effects are also presented.

Gavin & Doherty Geosolutions Limited (GDG) have undertaken the works to assess the effects of the proposed development on the soil and geological environment under the direction of TOBIN Consulting Engineers.

7.2 EXISTING ENVIRONMENT

The site is relatively flat lying with cutaway/cutover peat overlying glacial till/lacustrine marls. Glacial till also forms localised drumlins features across the site. The bedrock below the site mainly consists of limestone with some sandstone and shale. Due to the relatively flat, drained, cutaway nature of the site, the risk of a large-scale landslide is low. Due to the nature of the peat and subsoils at the site, construction of the scheme will require deep excavations at the turbine locations. Instability of soils will be localised to the extent of the excavations for the various infrastructure locations. A single geological heritage site, the Corlea trackway, is located close to, but outside, the southern boundary of the site. The development will not affect this geological heritage site.

7.3 POTENTIAL IMPACTS

The peat on site is currently being harvested by Bord na Móna and will continue to be harvested after project construction. Another potential geological resource, a shelly marl/calcareous mud, is present on the site. A number of locations on the site are also potentially suitable as borrow pits for extracting rock, sands or gravels. It is very unlikely the mud, rock, sand and gravels would ever be disturbed at this location, in the absence of this proposed development. The effect on natural geological resources will be reduced by management and reuse of geological materials onsite and efficient design of any borrow pits within the site boundaries.

The construction of the development has the potential (with no mitigation) to negatively affect the soil and geology mainly relating to the management of soils and the loss of construction and operational materials.

7.4 MITIGATION MEASURES

Many of the mitigation measures detailed in Volume II Environmental Impact Assessment Report (EIAR) have been based on CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice, (CIRIA, 2001). All works will be managed and carried out in accordance with the Construction and Environmental Management Plan and a Peat Management Plan. Together these will include for measures such as correct handling, storage and re-use of all excavated materials and dust control. Good site practice during project construction, operation and decommissioning will be applied to ensure no fuels, oils, wastes or any other substances are stored or handled in a manner on site in which they may spill and enter the ground.

Karst features such as turloughs, enclosed depressions and possible infilled sinkhole features have been identified near to but outside of the boundary of the site. Each turbine foundation will be investigated before and during construction to identify any potential karst features and with detailed design and monitoring also undertaken by a suitably qualified and experienced geotechnical engineer.

All temporary excavations on site will be assessed by a competent designer. Mitigation measures will be put in place to ensure the stability of these excavations during construction. The long-term stability of the area around the wind turbine foundations will be achieved by filling the area back up to existing ground level.

7.5 RESIDUAL IMPACTS

Following mitigation measures, the peat stability risk ranking is considered to be low. The proposed development site is not a sensitive site in terms of the soils and geological environment. Overall, the development of the project will have a negative, long-term effect, not significant, on soil and geology through the application of identified mitigation measures and appropriate management throughout the life cycle of the wind farm.

8 HYDROLOGY AND HYDROGEOLOGY

8.1 INTRODUCTION

This chapter summarises the existing hydrological, hydrogeological and water quality characteristics at the proposed Derryadd Wind Farm. This chapter also summarises the assessment of the impact on the water environment arising from the proposed development. The drainage of the proposed development is also considered which includes proposed mitigation measures to reduce any potential negative impacts associated with the construction and operation of the proposed development with residual impacts also outlined.

8.2 EXISTING ENVIRONMENT

On a regional scale, the site at Derryadd and its environs is in the Shannon Hydrometric Area and Catchment. At a local scale, the proposed wind farm is located between the Ballynakill River to the east and the Lough Bannow River to the west of the wind farm. All rivers ultimately discharge to the River Shannon. The proposed wind farm is located within an active peat extraction site. An extensive network of drainage channels is present throughout the peatland which is currently operated under IPC licence P0504-01 Mountdillon bog group.

The proposed development site is not located in a flood prone area (Flood Zone A or B). Drainage management works carried out as part of current site activities maintain drainage systems within the proposed development site and reduce the potential for surface water ponding. Data on historical flooding is limited but records do not indicate that flooding occurs on the downgradient streams. There are currently no known surface water abstractions from the streams adjacent to the site or from any surface water features <10km from the site boundary.

8.3 POTENTIAL IMPACTS

Construction Phase

During construction, there will be a risk of pollution from site traffic through the accidental release of oils, fuels and other contaminants from vehicles. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and fauna and flora. Mitigation measures are identified in Section 8.4. The presence of workers at the proposed development will lead to the generation of foul sewage from toilets and washing facilities. This foul sewage will be collected and tankered off-site for disposal at a licensed waste water treatment facility.

The construction of the temporary site compound areas, site access tracks, turbine foundations, turbine hardstands, laying of underground electrical cabling, borrow pits, drainage channels will involve the removal of vegetation and forestry and the excavation of peat, marl and mineral subsoil.

Exposed and disturbed ground may increase the risk of erosion and subsequent sediment laden surface water runoff. The release of suspended solids is primarily a consequence of the physical disturbance of the ground during the construction phase, if not correctly compacted. Incorrect site management of earthworks and excavations could, therefore, lead to loss of suspended solids to surface waters as a consequence of the following activities:

- Soil stripping, if necessary, to construct the access roads, passing bays, site compounds, turbine foundations, hardstands, borrow pits, turbines/hardstanding/roads and substations (A&B);
- Run-off and erosion from soil stockpiles (prior to reinstatement/profiling/side casting);
- Dewatering of excavations for turbine foundations, angle mast foundations and borrow pits (where necessary). The result of increased sediment loading to watercourses is to degrade water quality of the receiving waters and change the substrate character.

Operational Phase

With regard to water quality impacts, there will be no direct discharges to the surface water environment during the operational phase. Due to the nature of the development there will be vehicles periodically on the site at any given time. The potential impacts are limited by the size of the fuel tank of the vehicles using on the site. As a result, occasional/accidental emissions, in the form of oil, petrol or diesel leaks, which could cause slight/negligible temporary and localised contamination of site drainage channels.

As the site is current a peat extraction site, the installation of permanent infrastructure could result in a slight decrease in runoff during the operational phase of the wind farm. The proposed development represents 2.7% of the three peatland areas. The presence of hardstanding areas and the additional water control measures is likely to have a slight long-term beneficial impact on the water quality particularly in relation to ammonium and suspended solids.

The presence of occasional maintenance workers at the proposed substation will lead to the generation of foul sewage from toilets and washing facilities. This foul sewage will be collected and tankered off-site for disposal at a licensed waste water treatment facility. The potential for impact is slight to negligible and short-term. Potential impacts are of slight/negligible significance.

8.4 MITIGATION MEASURES

Construction Phase

In identifying and avoiding sensitive surface waters the proposed development has implemented 'avoidance of impact' measures. A number of mitigation measures are outlined below and are considered as in-built to the design of the project. These mitigation measures are a combination of measures to comply with legislation and best practice construction methods to be implemented in order to prevent water (surface and groundwater) pollution. Examples of these measures are the storage of potentially polluting materials in fully bunded tanks and controlling / reducing runoff from hardstand areas.

In order to mitigate potential impacts during the construction phase, best practice construction methods will be implemented in order to prevent water (surface and groundwater) pollution. A Construction Environmental Management Plan (CEMP) was developed for the project to ensure adequate protection of the water environment. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the CEMP.

All mitigation and management measures will be incorporated into the Surface Water Management Plan. Mitigation measures are incorporated into the CEMP and will be incorporated into the specification for the Civil Engineering Works contract. The implementation of the Surface Water Management Plan will be overseen by the appointed Site Ecologist and the Project Manager and will be regularly audited throughout the construction phase. The Project Manager will be required to stop works on site, if he/she is of the opinion that a mitigation measure or corrective action is not being appropriately or effectively implemented.

It is proposed, that during the ground clearance of the proposed development, water control measures will be implemented by the contractor to limit the volume of water that requires treatment. The contract documents and works requirements will specify the necessity for the contractor to take all precautions needed to prevent sedimentation of water channels. Contractors are required to specify temporary sediment control measures (i.e. grit traps or similar) that are employed along with a water attenuation during construction.

Operational Phase

Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. The potential impacts are limited by the size of the fuel tank of vehicles used on the site.

Within the selected substation, all fuel will be stored in bunded areas. The exception to this being double walled tanks equipped with leak detection, which do not require additional retention. A hydrocarbon interceptor will be installed at the proposed substation site with regular inspection and maintenance, to ensure optimal performance.

8.5 RESIDUAL IMPACTS

The following conclusions can be drawn in relation to surface water and groundwater:

- The site drains to a number of tributaries surrounding the site boundary, primarily to tributaries of the River Shannon;
- The site is underlain predominantly by low permeability shallow peat, marls, lacustrine/alluvial soils and limestone tills;
- Man-made drains are located throughout the site and will continue to operate as part of the existing water management system on site. The proposed drainage plan will further enhance the water management at this location;
- The site is generally low lying and flat with very low slope gradients and consequently has a low risk due to changes caused by the development on the hydrological regime;
- Water quality in the immediate area of the site is moderate and is consistent with the expected natural water quality for an environment. The water quality reported by the EPA downstream of the site is of poor/moderate status; and
- The site overlies both locally important and regionally important aquifers of Low to High Vulnerability.

The residual impacts on the surrounding water quality, hydrology and existing drainage regime at the site are considered to be negligible and short term in nature. The existing on-site drainage system will remain active during construction and operation of the proposed wind farm and will be enhanced by a proposed drainage plan that has been designed for this development.

The construction timescale of activities within the site will be phased and short-term in duration and, thereafter, the only activities within the site will be associated with maintaining existing drains, ongoing maintenance and monitoring during the operational phase. There are no significant long-term impacts.

9 LANDSCAPE AND VISUAL

9.1 INTRODUCTION

Chapter 9 – ‘Landscape and Visual’ (Impact Assessment) describes the landscape context of the proposed Derryadd Wind Farm and assesses the likely landscape and visual effects of the scheme on the receiving environment.

Landscape Impact Assessment (LIA) relates to assessing effects on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. Visual Impact Assessment (VIA) relates to assessing effects on specific views and on the general visual amenity experienced by people. Cumulative landscape and visual impact assessment is concerned with additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments, or actions that occurred in the past, present or are likely to occur in the foreseeable future.

This landscape and visual impact assessment is based on:

- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – Third Edition (2013).
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (2006).
- Scottish Natural Heritage (SNH) Assessing the Cumulative Impact of Onshore Wind Energy Developments (2012).

9.1.1 Study Area

The Wind Energy Development Guidelines published by the Department of the Environment, Heritage and Local Government (2006) specify different radii for examining the Zone of Theoretical Visibility of proposed wind farm projects (“ZTV”) based on Turbine Height. In the case of this project, the blade tips are up to 185m high and, thus, the minimum ZTV radius required is 20 km from the outermost turbines of the scheme. However, several recent wind energy applications within the Midlands have utilised a 30km radius study area and the same has been used in this instance for the sake of thoroughness and to reflect current best practice. The same extent of study area was also used for the consideration of cumulative effects.

9.2 METHODOLOGY

Production of this Landscape and Visual Impact Assessment involved desktop studies and fieldwork comprising professional evaluation by qualified and experienced Landscape Architects. This entailed the following:

9.2.1 *Desktop Study*

The desktop study comprised the following:

- Establishing an appropriate Study Area from which to study the landscape and visual effects of the proposed wind farm;
- Review of a Zone of Theoretical Visibility (ZTV) map, which indicates areas from which the development is potentially visible in relation to terrain within the Study Area;
- Review of relevant County Development Plans, particularly with regard to sensitive landscape and scenic view/route designations;
- Selection of potential Viewshed Reference Points (VRPs) from key visual receptors to be investigated during fieldwork for actual visibility and sensitivity;
- Preparation of an initial VRP selection map for consultation purposes (Planning Authority).

9.2.2 *Fieldwork*

Site visits were carried out at various times from 2016 to 2018 in order to:

- Select a refined set of VRPs for assessment.
- Record a description of the landscape elements and characteristics within the Study Area generally and also within view from each VRP.
- Capture high quality base photography from which to prepare photomontages of the proposal.

9.2.3 *Assessment*

The assessment of landscape and visual effects involves a description of the geographic location and landscape context of the proposed wind farm site as well as a general landscape description concerning essential landscape character and salient features of the wider Study Area. This is discussed with respect to; landform and drainage; vegetation and land use; centres of population and houses; transport routes and; public amenities and facilities. Consideration of design guidance, the planning policy context and relevant landscape designations are also considered.

Once the baseline environment was established an assessment of the likely potential significant effects associated with the proposed development was carried out. This included the following: Appraisal of salient landscape character.

- Appraisal of predicted landscape effects.

- Appraisal of predicted visual effects using standard ZTV maps as well as photomontages prepared from selected VRP locations.
- Appraisal of predicted cumulative effects using cumulative ZTV maps and cumulative photomontages.
- Discussion of mitigation measures.
- Assessment of residual effects following mitigation.

9.3 EXISTING ENVIRONMENT

The proposed wind farm site is contained on cutaway peatland across a series of almost contiguous bogs, which stretch around 12km in an elongated band in a northwest – southeast orientation. Thus, the site and central study area is a vast flat plain with few notable watercourses. To the east of the site, the Royal Canal marks a transition into slightly more elevated undulating ground which beyond that rises to form the modest Castlerea Mountain and Slieve Bawn Mountain. The terrain also inclines gently to the west of the site to form low hills that separate the central study area from the substantial sized Lough Ree on the River Shannon, which wraps around the western and south-western aspects of the central study area. The terrain on the western side of Lough Ree is also slightly elevated and undulating and there is another upland spine that runs to the north of Lough Ree between the settlements of Lanesborough and Strokestown. The terrain also rises to form a broad upland spine to the northeast of the settlement of Longford in the outer north-eastern quarter of the study area, whilst the northern extents are generally contained in a lake rich drumlin zone. Notwithstanding occasional spines of more elevated ground, the 30km radius study area can be described in general terms as a relatively flat lowland landscape.

The predominant land use of the site and central study area is commercial scale peat extraction for the purposes of energy generation and there is a substantial peat-fired power station at the settlement of Lanesborough near the north-western periphery of the site. Peatland areas occur frequently throughout the wider study area as well as on both sides of the River Shannon particularly to the north of the site. The peat bogs in this area are frequently interspersed with slightly elevated islands of free draining soils that are used for agriculture, whilst the transitional bog margins tend to be contained in peatland scrub or occasional commercial conifer plantations. Conifer plantations also occur in some of the more elevated areas, but in the context of the overall study area agricultural farming is the predominant land use forming a matrix of fields and hedgerows.

The most notable settlement in relation to the proposed Derryadd Wind Farm, on the basis of its size and proximity to the scheme, is Lanesborough, which is approximately 2km to the west of the northernmost portion of the site. The smaller villages of Keenagh and Killashee are situated approximately 2-3km east of the proposed site and Cloondara is approximately 4km to the northeast.

The most substantial sized settlements within the wider study area (beyond 5km o the site) include Longford Town, situated approximately 7km northeast of the site, Roscommon town approximately 17km west, Athlone approximately 21km south and Carrick on Shannon approximately 28km north of the site. Other notable settlements include Ballymahon approximately 8km southeast and Ardagh village situated approximately 10km east of the site.

The principal transport route contained within the wider study area is the M6 motorway between Dublin and Galway. The next highest order roads within the study area include the N4 and N5 national primary routes. The N63 and N55 national secondary routes pass through the central study area. Indeed, the N63, which is oriented in an east-west direction, passes directly through the proposed site to the east of Lanesborough. Other notable roads in the immediate vicinity of the site include the R394 and the R397 regional roads, whilst the R398 links between the R394 and the R397 passing through the southern section of the site. Several local roads are also situated in the immediate vicinity of the proposed wind farm site. The Dublin – Sligo national railway line passes through Longford approximately 9km northeast of the proposed site, whilst the Dublin to Galway national railway route passes through the settlement of Athlone, approximately 21km south of the site.

In terms of tourism heritage and amenity areas, the Corlea Trackway and visitor centre, which is approximately 1km to the south of the proposed Derryadd Wind Farm site. Lough Ree and the River Shannon are popular for fishing and boating and there are local walks around parts of the shoreline. The Hill of Uisneach is an ancient ceremonial hilltop in County Westmeath and is approximately 27km to the southeast of the site. Construction work is almost complete on Center Parcs Longford Forest site to the south of Ballymahon and this family holiday facility is due to open in summer 2019.

9.3.1 Policy Context and Designations

The Wind Energy Development Guidelines (2006) provide guidance on wind farm siting and design criteria for a number of different landscape types. The site of the proposed development is considered to be located within a landscape that is consistent with the 'Flat Peatland' landscape type, for which, a broad scale design response is generally recommended.

The Longford County Development Plan (2015-2021) includes a Landscape Character Assessment that divides the County into seven geographically distinct Landscape Character Units (LCUs). The proposed development is contained within 'LCU 6 – Peatlands' which is identified as a low sensitivity landscape, however, the corridor of the Royal Canal, which passes through this unit, has been given a 'high' sensitivity designation. Areas of County Longford with the potential for wind farm development and where wind farms will be encouraged are identified in Appendix 5 and this indicates the proposed wind farm site is substantially contained in a 'Preferred Location' for wind energy development. The

landscape and visual designations for the surrounding counties of Roscommon, Westmeath and Leitrim are also considered in the assessment.

9.4 POTENTIAL IMPACTS

9.4.1 *Landscape Effects*

There will be physical effects on the land cover of the site as a result of this development, but these will be predominantly short-term (during construction). Such effects will also be relatively minor in this cutaway peatland context due to the high proportion of existing access entrances that will be utilised during construction and operational stages. Internal site borrow pits will be utilised for the winning of construction material and these are of a relatively small scale in the context of the vast cutaway peatland context.

In terms of effects on landscape character, which is the main operational stage landscape effect consideration for this project, there is predicted to be a 'Moderate–slight' significance of effect within the central study area (c. 5km radius). Although higher sensitivity sections of the River Shannon and the Royal Canal are contained within this central zone, they do not have a strong influence on the overall landscape character beyond their immediate corridors. Conversely, the proposed wind farm is not considered to alter the salient character of these waterways even where there is a degree of inter-visibility.

The proposed wind farm will often be visible as a background feature in the context of the wider study area. However, it will be one of a range of rural land uses and will not significantly influence or alter landscape character even in the context of higher sensitivity landscape features, when diluted by distances in excess of 5km. Thus, the significance of landscape effect in the wider study area is considered to be Low, dissipating to Negligible with greater distance, as the proposed wind farm becomes a proportionately smaller component of the overall landscape fabric.

In respect of the landscape and wind energy policies contained within the Longford Landscape Character Assessment, which forms a part of the current Longford County Development Plan, it is considered that the proposal is an acceptable form of development that is appropriately sited entirely in a 'Low' sensitivity Landscape Character Unit (LCU6 - Peatlands), and the vast majority of the site is contained in a 'Preferred' area for wind energy development. The scheme is also deemed to be appropriately designed in respect of its receiving landscape context, which is consistent with the 'Flat Peatland' landscape type in the Wind Energy Development Guidelines (2006).

For all of these reasons, landscape effects generated by the proposed wind farm development are not considered to be significant.

9.4.2 Visual Effects

Visual effects were assessed at 50 no. Visual receptor locations throughout the study area. Visual receptor sensitivity is considered to range widely across the study area between Very High at VP24 – ‘Hill of Uisneach’ and Low for several of the ‘major route’ receptors where visual amenity is strongly influenced by the busy road corridor. Those receptor locations at the upper end of the spectrum (High to High-medium) tend to be designated scenic views from hilltops and elevated ground where vast panoramic views are afforded across the relatively homogenous rural and peatland landscape of the Midlands. At the lower end of the spectrum are locations that take in more contained views from within the rural lowlands where hedgerow vegetation tends to limit the extent of views across typical rural farmland.

The majority of visual effect magnitude judgements are in the mid to low range due to a combination of high levels of screening, the dispersed layout of the scheme and the robust rural landscape context in view. However, there are a small proportion of views within close proximity to turbines where mid to high order visual effects are considered to occur. At these locations, the nearest turbines invariably have a dominant visual presence within the scene and the intensity or lateral extent of turbines is also likely to be considerable. A notable aspect of this proposed wind farm is that there are several VRP locations where the turbines have a highly dominant or dominant visual presence that is moderated in terms of aesthetics by a clear and legible view of the proposed development running away from the viewer with a strong sense of perspective across a broad peatland context.

The highest magnitude of visual effect recorded for this proposed project is considered to be ‘Substantial-moderate’ and this occurs at a viewpoint representing a local graveyard and amenity area to the north of the site (viewpoint LC1) and at Corlea Trackway Visitors Centre (viewpoints AH3). This level of significance occurs at LC1 as a result of turbines being prominent within the view and appearing intermittently at different scales above and between sections of intervening vegetation. At AH3 the nearest turbines also very prominent, but they are seen with a high degree of legibility and within a vast cutaway peatland context that can absorb the scheme in terms of scale and extent. The next highest significance of visual effect is Moderate and this occurs at five VPs, whilst seventeen of the VP locations are considered to incur a Moderate-slight significance of effect. At the remaining 26 no. VP locations, the significance of visual effect ranges between Slight and Imperceptible.

Based on the findings of the visual effect assessment, it is considered that although the proposed wind farm will result in long-term visual effects, these are readily reversible upon decommissioning and such effects are not considered to be significant.

9.4.3 Cumulative Effects

There are presently two existing wind farms within the study area, so wind energy development is considered to be a familiar, but not strongly characteristic or defining feature of the landscape within the study area. The proposed wind farm will most commonly be viewed in isolation from within the lowland context of the study area, but from occasional elevated vantage points, which also tend to be designated as scenic views, the proposal will be commonly seen in conjunction with the Sliabh Bawn Wind Farm (20 turbines) some 8km to the northwest. Aside from the physical separation between these schemes, they occupy different landscape contexts with Sliabh Bawn on an upland ridge and the proposed Derryadd Wind Farm on flat cutaway peatland. This contextual separation tends to accentuate the physical distance between them and there is little sense of wind energy proliferation within the study area.

9.5 RESIDUAL IMPACTS

Overall, it is considered that the proposed development will contribute to wind energy development becoming a more characteristic feature of this Midlands context, but it is not considered to give rise to significant cumulative effects.

10 MATERIAL ASSETS – SHADOW FLICKER

10.1 INTRODUCTION

This chapter assesses the potential impact of shadow flicker on nearby properties arising from the proposed development.

Shadow flicker is a phenomenon that arises when an operational wind turbine is located between an observer (located indoors) and the sun – most common when the sun is low in the sky. Rotating wind turbine blades can cause brightness levels to vary periodically at locations where they obstruct the Sun's rays. This can result in a nuisance when the shadow is cast over the windows of residential properties. This intermittent shadow is described by the term 'shadow flicker' and it can be a cause of annoyance at residences near onshore wind turbines if it occurs for a significant period of time during the year.

Shadow flicker effects are only possible if there is an unobstructed path from the turbines to a window. If there is no view of the turbines from a dwelling, there will be no noticeable effects because the turbine's shadow will not pass over the window.

Shadow flicker can only occur if one or more turbine rotors was located between an observer within a dwelling and the sun. Shadow flicker would not occur under various real-world conditions, for example if the sky is overcast, the rotor was not spinning for any reason or blinds/curtains were drawn at the receptor location.

The proposed development comprises of 24 No. turbines and the shadow flicker assessment (technical assessment and modelling undertaken by "Pager Power") is based on the turbine locations and dimensions described in Chapter 2 of the EIAR.

Pager Power's modelling approach in this assessment is consistent with the recommendations of the 2006 Wind Energy Development Guidelines i.e. the acceptable limit for shadow flicker in Ireland is 30 hours per year with a maximum of 30 minutes per day. However, the shut-down times in Appendix 10.2 have been defined for a 'minimal effects' scenario in response to the requirements of the 'preferred draft approach' (DHPCLG, 2017) and as the worst-case impact on the operation of the windfarm.

Pager Power uses WindFarm software for its analysis, which is one of the industry standard models referenced within the Parsons Brinckerhoff – Update of UK Shadow Flicker Evidence Base (2011) guidance document.

10.2 EXISTING ENVIRONMENT

Receptor locations were identified based on inspection of mapping including aerial and street-level imagery. A total of 151 receptor locations (comprising habitable residences) were identified within the 10-rotor diameter buffer from the turbine locations.

The shadow flicker model makes a number of simplifications and assumptions, and as such represents a worst-case scenario. For example, the model assumes:

- Every house has a window directly facing the wind farm;
- Daylight hours consist of 100% sunshine;
- The wind direction is always parallel with the line between the sun, the turbine and the window in question; and
- There are no obscuring features, such as trees or hedgerows, around the residences, which would minimise views of the development and hence reduce or eliminate the potential for shadow flicker.

This approach represents a worst-case scenario because it maximises the potential for shadow flicker effects to occur and, therefore, predicts an over estimated potential impact.

10.3 POTENTIAL IMPACTS

Shadow flicker effects are only possible if there is an unobstructed path from the turbines to the window. If there is no view of the turbines from the location of a receptor, there will be no noticeable effects because the turbine shadow will not pass over the window.

Survey data regarding the level of visibility may inform the results of this assessment further. However, based on the scale of the wind farm it is reasonable to assume that a significant level of visibility will be available from the surrounding areas. It is reasonable and conservative to model effects based on assumed visibility as this captures a worst-case scenario.

The technical assessment has shown that the majority of the 151 assessed receptors would experience some effects, based on a conservative worst-case approach to the assessment, in the absence of mitigation measures. Less than half of the receptors would experience less than 30 minutes per day and less than 30 hours per year – which is acceptable based on the current limits. Mitigation is to be applied that will ensure that all effects are within acceptable limits, should the wind farm be consented.

Factors including cloud cover, variable wind speeds/direction and likely maintenance requirements will act to reduce the potential effects in real terms.

There will be no potential effects relating to shadow flicker during the construction phase of the proposed development. For the duration of the operational life of the proposed development, unmitigated, the worst-case potential impact from shadow flicker at specific localised receptors will be likely, significant and long-term but have a momentary effect with respect to the duration of impact on a daily basis.

10.4 MITIGATION MEASURES

Screening Assessment

The shadow flicker modelling predicts a worst case 'bare earth' impact. In reality, existing screening in the form of buildings, vegetation and local topographic variations will have a significant impact on the level of shadow flicker that is predicted to be experienced by the sensitive receptors. When these additional screening features are taken into account, the actual impact in terms of incidence and duration may be significantly reduced or even eliminated. If existing screening reduces the impact below acceptable levels then no further mitigation will be required.

Screening Measures

If existing screening is not sufficient to reduce shadow flicker to acceptable levels (either the existing levels outlined in the Wind Energy Development Guidelines (2006) or Guidelines finalised during the consenting process) then additional screening measures will be proposed. Through interaction with the individual sensitive receptors, the incidence and level of shadow flicker at the specific location will be verified. Once verified, a number of measures will be proposed to the property owner such as installation of blinds/curtains in the affected room(s), planting of new screening at identified locations within the curtilage of the property and any other site-specific measures that might be agreeable with the affected party. Once the agreed measures are implemented, the effectiveness of the measures will be monitored over a period of months to establish the reduction in impact. The costs of the agreed mitigation measures will be borne by the developer. If the proposed measures are not agreeable, or the implemented measures are not effective in reducing the incidence and duration of shadow flicker to acceptable levels, then a turbine(s) shutdown scheme will be developed and implemented.

Turbine Shutdown Scheme

A worst-case turbine shutdown scheme is presented in Appendix 10.2 of the EIAR. In principle, the required times and dates for the proposed shutdown scheme (if implemented) will be programmed into the wind farm control system to automatically stop the rotor of the specific turbine(s) from turning at times when potential effects would result from the operation of the turbine. The worst-case turbine shutdown scheme presented in Appendix 10.2 will be updated (should the wind farm be consented) to reflect the impact of both the screening assessment, applied screening measures and the acceptable limits.

The implementation of the proposed mitigation measures, including a shutdown scheme to minimise any potential significant effects from the proposed development, will reduce the overall effect of the development to slight and long term.

10.5 RESIDUAL IMPACTS

There will be no residual shadow flicker impacts associated with the proposed development following the implementation of the mitigation measures outlined in Section 10.4 above. In summary, the potential effect of the proposed development will be slight and long term.

In conclusion, the potential for shadow flicker effects has been technically assessed considering the appropriate technical parameters and conservative assumptions. The results have been interpreted with reference to the appropriate guidance. The applicant is committed to mitigation that will ensure that any residual effects are within the acceptable limits

11 MATERIAL ASSETS – TELECOMMUNICATIONS, AVIATION AND EMF

11.1 INTRODUCTION

This Chapter assesses the effect on Telecommunication signals, broadcast signals, aviation and EMF arising from the proposed Derryadd Wind Farm located within the Moundillon group of peat extraction bogs County Longford. There are many operators of wireless radio equipment in the vicinity of the proposed development.

11.2 EXISTING ENVIRONMENT

The proposed Derryadd Wind Farm site is situated within a rural area and all of the Telecommunications, aviation and broadcast signals that are used locally are wireless in nature. Microwave radio signals are used nearby to the site for the bulk transportation of information signals by many different types of operators.

As part of the work in preparing this EIAR, approximately 55 stakeholders were identified and contacted about the proposed development at Derryadd. These stakeholders represented National and local Telecommunications operators, Radio and Television operators, Utility operators, Security, health and the Defence forces as well as broadband providers and aviation operators. A number of rounds of consultation were used to improve the wind farm plans and overcome any early concerns of operators.

11.3 POTENTIAL IMPACTS

Should the development of the windfarm be approved, there will be no effect on most telecommunications, broadcast radio, broadband and aviation from the current status quo.

During the consultation process, the stakeholders were contacted and detailed simulations were made with many of these stakeholders which allowed the modelling of the turbines and their interaction with Telecommunications and broadcast signals to be assessed. As a result, it was possible to make changes to the proposal to eliminate interference and to give comfort to operators that their required clearances were included to protect their microwave radio services.

RTÉ Network have advised that some limited interference to digital TV reception may be expected by residents near Lanesborough village.

Ripplecom, a broadband wireless provider noted that they have 5 end users who may find constant interference to their broadband service reception.

ESB Telecoms have engaged in preliminary discussions on the project and have requested a restriction on micrositing of one (T16) and further options to avoid interference to their circuits.

11.4 MITIGATION MEASURES

Potential effects arising from turbine operation have been minimised through a number of rounds of consultation with stakeholders where some microwave circuits were moved away from the proposed turbine locations.

For RTÉ Networks Ltd (2rn) a protocol has been agreed and it will be signed by the developer. The agreement states that the developer undertakes to work with RTÉ Networks to remediate any interference that may be found to Television to the satisfaction of RTÉ Networks Ltd.

Broadband services will be protected in a similar manner by realignment of reception aerials to other transmitters. This approach will be applied should any interference be found.

For ESB Telecom Services, Bord na Móna are in agreement with them on a restriction on the final location of Turbine No. 16. Consultation with ESB Telecom Services will continue during the post-consent phase of the project.

11.5 RESIDUAL IMPACTS

The proposed construction works will have a negligible effect on the local radio environment. Implementation of the proposed mitigation measures will ensure that the residual effect of the proposed development is not significant/imperceptible.

12 AIR QUALITY AND CLIMATE

12.1 INTRODUCTION

This Chapter assesses the effect on air quality and climate arising from the proposed Derryadd Wind Farm located within the Moundillon group of peat extraction bogs County Longford.

12.2 EXISTING ENVIRONMENT

The proposed Derryadd Wind Farm site is situated within the EPA's 'Rural East' Air Quality Index for Health Region. The most recent reporting by the EPA indicates that the current air quality in this region is classified as "Good" (according to EPA records accessed on 11/01/19). Meteorological data has been received from Met Éireann. All calculations detailed in the EIAR report are carried out using methods advised by Met Éireann. There are 25 national synoptic stations and, where required, data has been referenced in the EIAR chapter from the nearest synoptic station which is located in Mullingar in County Westmeath. Meteorological data gathered from the Moundillon Met Éireann Weather Station, located approximately 3.8km north west of the proposed wind farm site has also been used in this assessment.

12.3 POTENTIAL IMPACTS

While there will be some dust and exhaust emissions from construction activities during the construction phase, these effects will be of temporary duration and not considered likely to give rise to significant effects to air quality and climate following the implementation of mitigation measures. While in operation, the proposed Derryadd Wind Farm will have a positive effect on air quality and climate by avoiding emissions of pollutants and greenhouse gases that would otherwise be emitted from a conventional, fossil fuel fired generation plant. The generation of electricity from wind energy avoids the emissions of nitrogen oxides, sulphur dioxide, ozone and especially carbon dioxide. The proposed development is therefore likely to have an indirect, positive effect on air quality and climate.

12.4 MITIGATION MEASURES

Potential effects arising from dust emissions will be minimised through the provision of mitigation measures that will be incorporated into the Construction Environmental Management Plan (CEMP). All contractors will ensure that machinery used on site is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from construction traffic. No mitigation measures are required for the operation of the proposed wind farm in respect of air quality and climate.

12.5 RESIDUAL IMPACTS

The proposed construction works will have a negligible effect on air climate. There is likely to be a slight and short-term effect on air quality through dust generation during the construction stage of the entrance road(s) and grid connection which will be mitigated effectively through the incorporation of mitigation measures into the Construction Environmental Management Plan (CEMP).

Electricity generated by the wind farm will result in an avoidance of greenhouse gas emissions that would otherwise occur through generation from fossil fuel sources. The carbon payback on the Derryadd Wind Farm is calculated to be 1 to 2 years. In the context of an operational lifetime of 30 years, emissions of nitrous oxides (NO_x), sulphurous oxides (SO_x), particulate matter (PM) and secondary pollutants, such as ozone, will also be avoided. The avoided emissions, therefore, result in a moderate, positive effect on both air quality and climate.

13 NOISE AND VIBRATION

13.1 INTRODUCTION

This section of the EIAR provides as an assessment into the likely environmental noise and vibration impacts of the proposed Derryadd wind farm development. This assessment has been undertaken by AWN Consulting Limited.

13.2 EXISTING ENVIRONMENT

The background noise environment has been established through noise monitoring surveys undertaken at several noise sensitive locations (NSLs) surrounding the proposed development. Typical background noise levels for day and night periods at various wind speeds have been measured in accordance with best practice guidance contained in the Institute of Acoustics document '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' (IoA GPG). Prevailing noise levels are primarily attributable to local road traffic noise and agricultural and human activity in the surrounding area.

13.3 POTENTIAL IMPACT

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the long-term operational phase.

The assessment of construction noise and vibration and has been conducted in accordance with best practice guidance contained in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise* and *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration*.

Subject to good working practice as recommended in the EIAR Chapter, noise associated with the construction phase is not expected to exceed the recommended threshold values. The associated construction noise and vibration are not expected to cause any significant effects.

Based on detailed information on the site layout, turbine noise emission levels and turbine height, worst-case cumulative omni-directional turbine noise levels have been predicted at NSLs for a range of operational wind speeds. The predicted noise levels associated with the proposed development will be within best practice noise criteria curves recommended in Irish guidance '*Wind Energy Development*

Guidelines for Planning Authorities' and it is not considered that a significant effect is associated with the development.

No significant vibration effects are associated with the operation of the site.

13.4 MITIGATION MEASURES

The noise and vibration assessment has demonstrated that the impacts associated with both construction and operational phases are expected to be within the recommended threshold values and, therefore, no mitigation measures are required.

13.5 RESIDUAL IMPACTS

In summary, the noise and vibration impact of the proposed development is not significant considering current national guidance.

14 TRAFFIC AND TRANSPORT

14.1 INTRODUCTION

An assessment of the traffic effects of the proposed development was undertaken for both the construction and operational stages of the development.

14.2 EXISTING ENVIRONMENT

The assessment considered the impact that the traffic generated by the proposed development would have on the local highway network and also considered the geometric capacity of the route with respect to the abnormally large vehicles required to deliver the turbine plant to the site.

14.3 POTENTIAL IMPACTS

Traffic Route & Study Area

The optimum delivery route for the large turbine plant was identified to be via the M6 to Athlone and onward to the site via the N61 to Roscommon, followed by the N63 to Lanesborough. From Lanesborough the route for the large turbine plant heads south on the R392, from which all turbine deliveries will access the site from a new access junction.

General deliveries will gain access to the site from one of the 4 No. construction phase junctions accessing the proposed site. During the operational phase of the proposed development there will be 6 points of access to the site to provide for recreational use.

Vehicle types and network geometry

The types of vehicles that will be required to negotiate the local network will be up to 70.0 metres long, for a blade length of 65.0 metres. A detailed assessment of the geometric requirements of the delivery vehicles was undertaken. Locations where it was established that the existing road geometry will not currently accommodate all of the vehicles associated with the proposed development are highlighted, with the extent of remedial works indicated. The preliminary assessment shows that all works required to accommodate the wind turbine vehicles are within the curtilage of the public road network. In addition to the assessment presented, it is recommended that a dry run is undertaken by the transport company to check vertical and horizontal clearance on the transport route prior to construction.

Traffic impact on local network

In terms of daily traffic flows it is estimated that the impact of the development traffic will be as follows:

- During the 24 days that the concrete foundations will be poured it is forecast that traffic volumes will increase on the study network ranging from 5.5% on the N61 to the south of Roscommon, to 17.8% on the R392 approaching the site. During this period, the effects on the network will be slight to moderate and will be temporary.
- During the remainder of the site preparation and groundworks stage, traffic volumes will increase by 4.7% on the N61 south of Roscommon, up to 15.1% on the R392 leading towards the site. During this stage the effects will be slight to moderate and will last for 576 days.
- On the 43 days that the wind turbine plant is delivered to the site 5 abnormal loads will travel on the network, which should be undertaken during night-time hours. On these days traffic volumes will increase ranging from 2.1% on the N61 to 6.7% on the R392. The effects will be slight (if undertaken during the night) to moderate (if delivered during the day) and will be temporary.
- For an additional 24 days, an additional 95 PCUs will be generated on the study network increasing traffic volumes on the N61 by 1.1%, and on the R392 by 3.5%. The traffic impact will be minimal on these days with the effects slight and temporary.

14.4 MITIGATION MEASURES

Mitigation by Design

Mitigation by design measures include the following;

- Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles as set out in Appendix 14.1; and
- Approximately 50% of gravel and stone material being obtained from borrow pits located within the site boundary.

Mitigation Measures During the Construction Stage

The successful completion of this project will require significant coordination and planning and a comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the Proposed Development.

A detailed Traffic Management Plan (TMP), incorporating all the mitigation measures set out in the TMP submitted as part of the CEMP, included in Appendix 2.2 of this EIAR, will be finalised and agreed with the relevant roads authorities and An Garda Síochána prior to construction works commencing on site. The detailed TMP will include the following:

- Traffic Management Coordinator – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
- Delivery Programme – a programme of deliveries will be submitted to Longford County Council in advance of the delivery of the turbine components to site.
- Information to locals – Local residents in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (if required) or any night deliveries of turbine components, via letter drops and posters in public places. Information will include the contact details of the Contract Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
- A Pre- and Post- Construction Condition Survey – A pre-condition survey of roads associated with the Proposed Development will be carried out prior to construction commencement to record the condition of the road. A post construction survey will be carried out after works are completed. The timing of these surveys will be agreed with the local authority.
- Liaison with the relevant local authority - Liaison with the relevant local authority including the roads sections of local authorities that the delivery route traverses and An Garda Síochána, during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required.
- Implementation of temporary alterations to road network at critical junctions.
- Identification of delivery routes – These routes will be agreed and adhered to by all contractors.
- Travel plan for construction workers – While the assessment above has assumed the worst case that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site and identification of an area for parking.
- Temporary traffic signs – As part of the traffic management measures temporary traffic signs will be put in place at all key junctions, including the access junctions on the N63, R392, R398, L1136 and L11554. All measures will be in accordance with the *“Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works”* (DoT now DoTT&S) and *“Guidance for the Control and Management of Traffic at Roadworks”* (DoTT&S). A member of construction staff (flagman) will be present at all junctions (with the exception of the L11554) during peak delivery times.
- Delivery times of large turbine components -The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.
- Additional measures - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required.

- Re-installation works - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.
- Road Opening Licence – Roads works associated with the grid connection cabling will be undertaken in line with the requirements of a road opening licence as agreed with the relevant County Council.
- Trench Reinstatement - Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority. Following temporary reinstatement of trenches sections of public roads along which the cable route travels will receive a surface overlay subject to agreement with the roads authority.

Due to the very low volumes of traffic forecast to be generated during the operational stage of the development, no mitigation measures are required. It is, however, proposed to monitor the situation on the ground by means of a traffic survey

14.5 RESIDUAL IMPACTS

During the 24-month construction stage of the proposed Derryadd Wind Farm development, it is forecast that the additional traffic that will appear on the delivery routes will have a slight to moderate and short-term effect on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan.

Road works required to lay the grid connection cable will generally be installed in a trench at the side or in the corridor of the road, which will result in local, short term delays to traffic. It is unlikely that any road closures will be required.

While traffic delays will be incurred resulting in a slight, temporary impact on local traffic, and potentially on local businesses, it is noted that only a short section of the cable route, and the trips that pass through it, will be affected each day.

As the traffic impact of the proposed development will be imperceptible, long-term during the operational stage, there will be no residual effects during this stage of the development.

15 CULTURAL HERITAGE

15.1 INTRODUCTION

The cultural heritage chapter was prepared by Through Time Ltd. It presents the results of a cultural heritage impact assessment prepared as part of the Environmental Impact Assessment Report for the proposed Derryadd Wind Farm, Co. Longford (the 'proposed development'). It assesses the likely significant effects of the proposed development on the archaeological, architectural and cultural heritage environment. The layout of the proposed development was designed with consideration of the known cultural heritage, ensuring minimum impact on known above ground archaeological/architectural/cultural heritage features. The proposed development will involve ground disturbance in all elements of the proposal.

15.2 EXISTING ENVIRONMENT

The bogs of Derryaroge, Derryshannoge, Derryadd and Lough Bannow were first brought into industrial peat production in the 1950's and continue today. The peat was removed from the bog via a railway system, with some of the tracks, or sections of them still in place. To reduce the moisture content of the peat material during the years of peak industrial activity it was necessary to drain the entire bog. This was achieved by the excavation of a network of north to south running drains. The drainage network facilitated heavy plant and machinery to safely traverse the bog. As a result of the drainage channels the entire site is divided into plots referred to as 'peat fields'. These peat fields span the length of the bog. In some areas they have been exploited to a depth of 0.5 m or less above the natural mineral soil.

Numerous archaeological surveys, excavations and re-assessments have been carried out at the bogs, the earliest in the 1950's, the latest survey in 2013 and archaeological excavations in 2015. Three hundred and six recorded monuments are located within 500m of the proposed development infrastructure, however many of these have been excavated or removed during peat operations. Recorded monuments include wooden platforms, rows of posts, wooden structures and trackways, the most famous of which is the Corlea Trackway located approximately 1km from the proposed development.

The historic towns of Lanesboro, Keenagh and Killashee are located in the vicinity of the proposed development. Recorded Protected Structures and features recorded in the National Inventory of the Architectural Heritage are also found in the area.

The walk over survey was restricted to areas where over-growth was sparse or non-existent. Inspection of drain section faces and a walkover of the area yielded nothing of archaeological interest.

Furthermore, the archaeological assessment found that the proposed development will not affect any known features or artefacts.

15.3 POTENTIAL IMPACTS

Archaeological finds recorded in the topographical files of the National Museum of Ireland indicate human activity in the general area from the Neolithic period with majority of the artefacts recovered from a peat environment. The assessment recorded that there are three hundred and six recorded monuments located within 500m of the proposed development infrastructure. No extant recorded monument will be directly impacted by the proposed development. The proposed development will have a long-term neutral effect of no significance on extant recorded monuments. No National Monuments and/or Protected Structures are located within 500m of the proposed development infrastructure. The proposed development will have a long-term neutral effect of no significance on National Monuments, Protected Structures and NIAH located within 500m of the proposed development infrastructure.

Some areas of the bogs are overgrown, preventing a visual inspection as part of the assessment. Archaeological features and/or artefacts may survive in these overgrown areas and therefore the proposed development may have a direct negative effect on archaeology.

The field walkover of the proposed development recorded no features and/or finds of archaeological significance on the surface of the peat or within the drains. It is possible, however, that hitherto unrecorded sub-surface archaeology survives below ground level, either within the peat or at the level of the underlying natural subsoil. Ground disturbance associated with the proposed development may have a potential impact on unrecorded sub-surface archaeology and mitigation for this potential impact is proposed for the construction phase of the development.

The proposed development will involve the construction of twenty-four turbines and associated infrastructure. There will be an indirect, significant effect (visual) during construction and operation on the cultural heritage environment in the following areas; Corlea Trackway Visitor centre (LVIA AH3); The Royal Canal (LVIA AH1-2, LC3); the RPS and NIAH of the town of Killashee (LVIA CP4).

During construction machinery will have a temporary negative effect on the surrounding archaeological, architectural and cultural heritage landscape. While some of the proposed development infrastructure will be visible from surrounding recorded cultural heritage sites, it should still be possible to view part of the site, without the infrastructure/construction machinery in the background.

There will be no significant visual effect on extant monuments with any significant surface expression as many of the recorded monuments in the immediate surrounds have been excavated or removed

during peat operations. The turbines will be visible from the recorded monuments that do survive in the area and from a considerable distance in the surrounding landscape. Numerous Recorded Protected Structures and National Inventory Architectural Heritage structures recorded in the area of the proposed development have some screening surrounding therefore the proposed development will have a neutral effect of no significance on setting.

15.4 MITIGATION MEASURES

Some parts of the footprint of the development have revegetated to the extent that they are overgrown preventing a full assessment. The National Monuments Service, Department of Culture, Heritage and the Gaeltacht, requires these areas to be cleared. The clearance of overgrown areas during construction is to be monitored by an archaeologist, under licence as issued by the minister (DCHG) under section 26 of the National Monuments Acts (1994-2014). In the event of archaeological features, finds and/or deposits being encountered during the monitoring, all relevant authorities should be notified immediately. Preservation in-situ or preservation by record (excavation) may be required.

The following mitigation measures will be implemented during the construction phase:

- All ground disturbance associated with the construction of the proposed development will be monitored by a suitably qualified archaeologist working under licence as issued by the minister (DCHG) under section 26 of the National Monuments Acts (1994-2014).
- In the event of archaeological features, finds and/or deposits been encountered during the monitoring, all relevant authorities should be notified immediately. Preservation in-situ or preservation by record (excavation) may be required.

It is not possible to mitigate against potential negative effects on setting arising during construction and operation of the proposed development. Therefore, no mitigation measures are being proposed. However, it should be noted that the construction phase will be short-term. In addition, the proposed development was redesigned a number of times based on environmental surveys and feedback from the consultation process. Areas from the original study area were excluded from the proposed development including Cloonboney and the northern area of Derryaroge Bog. The redesign resulted in a reduction in the number of turbines proposed for this development and, as such, reduced the potential impact on the setting of cultural heritage features.

In the absence of mitigation, likely effects during the operational phase of the windfarm infrastructure will have a slight/moderate effect on cultural heritage.

15.5 RESIDUAL IMPACTS

This assessment has identified no likely significant direct effects from the proposed development on the receiving environment (where accessible), given the layout and design of the proposed development and the mitigation measures recommended. The proposed development will have a significant indirect (visual) effect on the surrounding archaeological, architectural and cultural heritage landscape.

Therefore, the overall effect on cultural heritage as a result of the proposed development is assessed as slight/moderate.

16 INTERACTION OF THE FOREGOING

The significant effects of the proposed development and the measures proposed to mitigate these effects have been outlined in this EIAR. However, in any development with the potential for environmental effect there is also the potential for interaction between effects of the different environmental aspects.

The result of these interactions may either exacerbate the magnitude of the effect or may in fact ameliorate it. As part of the requirements of an EIAR, the interaction of the effects on the surrounding environment needs to be addressed.

Table 16.1 below outlines the different environmental aspects which have potential to interact as a result of the proposed development. Interactions have been clearly identified in the early stages of the project and where the potential exists for interaction between environmental impacts, the EIAR specialists have taken the interactions into account when making their assessment. Potential interactions (both positive and negative) have been considered for the construction, operation and decommissioning phases of each of the different environmental aspects. Details of the potential interactions of each of the different environmental aspects are provided in Chapter 16 of the EIAR.

All environmental factors are interrelated to some extent. However, the most common interactions are between human beings and visual perception, noise, air quality and ecological resources. Having studied the interaction of potential impacts during the construction, operational and decommissioning phases it has been determined that no amplification effect is anticipated. The proposed development will have some positive impacts on an international, national, regional and local level. It is important to note that the physical, environmental and landscape and visual impacts are almost entirely reversible upon decommissioning of the development.

Table 16-1: Interaction between Environmental Aspects (positive and negative)

Interaction Matrix	Biodiversity	Land, Soils & Geology	Hydro (Ology & Geology)	Landscape & Visual	MA/Shadow Flicker	MA/ Telecomms Aviation & EMF	Air Quality & Climate	Noise & Vibration	Traffic & Transport	Archaeology, Architect. & C. Heritage	Population & Human Health
Biodiversity		√	√	√				√	√		
Land, Soils & Geology			√				√			√	√
Hydro (Ology & Geology)											√
Landscape & Visual								√	√	√	√
MA/Shadow Flicker											√
MA/Telecomms . Aviation & EMF							√				√
Air Quality & Climate									√		√
Noise & Vibration									√		√
Traffic & Transport											√
Archaeology, Architect. & C. Heritage											
Population & Human Health											

17 MATRIX OF MITIGATION MEASURES

Mitigation of potential impacts has been incorporated into the proposed development either by avoidance of potential impacts or by the design of the proposed development (as described in Chapter 3 of the EIAR, Reasonable Alternatives). Where relevant, these measures are detailed in each chapter of the EIAR.

In addition, during the construction and operational phases of the development, all personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the Construction Environmental Management Plan (CEMP). During the construction phase of the development, all works associated with the construction of the proposed Derryadd Wind Farm will be undertaken with due regard to the guidance contained within CIRIA Document C741 '*Environmental Good Practice on Site*' (CIRIA, 2015).

Chapter 17 of the EIAR includes a "Schedule of Mitigation Measures" which summarises the mitigation measures proposed within the EIAR.