

NON-TECHNICAL SUMMARY

Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by MKO on behalf of Bord na Móna Powergen Ltd who intends to apply to An Bord Pleanála for planning permission for a proposed wind farm development located in Derrinlough and adjacent townlands, Co. Offaly.

The townlands in which the wind farm site, ancillary works and grid connection are located, are listed in Table 1.

Table 1 Townlands within which the proposed development is located

Townland	
Ballindown	Derryad (Eglish by)
Balliver	Derrymullin and Loughderry
Broughal	Drinagh
Carrick (Garrycastle by)	Galros East
Clongawny More	Galros West
Cloonacullina	Guernal
Clooneen	Kilcamin
Coolreagh or Cloghanhill	Lumcloon
Cortullagh or Grove	Mullaghakaraun Bog
Crancreagh	Stonestown
Dernafanny	Timolin
Derrinlough	

The proposed development will encompass 21 No. wind turbines up to a tip height of 185m and will have a maximum export capacity (MEC) in excess of 85MW. On the 25th November 2019, An Bord Pleanála decided that the proposed development falls within the scope of Strategic Infrastructure Development under Section 37A of the Planning and Development Acts 2000 to 2019.

The proposed development, known as Derrinlough Wind Farm, will be located on Clongawny and Drinagh Bogs which are part of the Boora peat production bog group in Co. Offaly. Although peat extraction has currently ceased at the site, it continues to comply with the requirements of the IPC licence for Boora bog group (IPC Licence Register No. P0500-01) which is regulated by the Environmental Protection Agency (EPA).

The Derrinlough Briquette Factory is located between the two bogs, along the N62 on the eastern side of the road. This plant processes the peat from a number of bogs in the midlands into briquettes and consists of the factory and a number of ancillary buildings. The briquette factory is in operation since

1960. The surrounding bogs were developed and drained during the 1950's in order to be available to the Briquette factory when it commenced processing in 1960.

The land uses and types within the proposed development site are a mixture of bare cutover and cutaway peat, re-vegetation of bare peat, commercial forestry, telecommunications (a 30m Mast) and wind measurement (a single 100m anemometry mast on Clongawny Bog). There are also a number of Bord na Móna rail lines that pass through the bogs facilitating the transportation of milled peat to the Briquette Factory.

The ESB owned, peat powered, West Offaly Power Station, which is scheduled to close in 2020, is a significant piece of energy infrastructure in the area and is located immediately south of Shannonbridge with the peat supplied from the surrounding Bord na Móna bogs.

Grid infrastructure in the area includes a 400 kV line from Moneypoint to Woodland Station near Dublin which runs approximately 3km to the south of the site. There are two 220 kV lines, one running south from Shannonbridge approximately 1km to the west of Clongawny bog and another running eastwards from Shannonbridge approximately 7 km to the north of both bogs. There is also a 110 kV network in the area with two lines running to the north of Clongawny and Drinagh, one line to the west of Clongawny and one line to the east of Drinagh.

Need for the Proposed Development

The EU adopted Directive (2009/28/EC) on the Promotion of the Use of Energy from Renewable Sources in April 2009 which includes a common EU framework for the promotion of energy from renewable sources. The Directive sets a mandatory national target for the overall share of energy from renewable sources for each Member State.

To ensure that the mandatory national targets are achieved, Member States must follow an indicative trajectory towards the achievement of their target as outlined in Ireland's National Renewable Energy Action Plan (NREAP). Ireland's mandatory national target is to supply 16% of its overall energy needs from renewable sources by 2020. This target covers energy in the form of electricity (RES-E), heat (RES-H) and transport fuels (RES-T). The contribution of renewables to gross final consumption (GFC) was 9.5% in 2016, compared to the 2020 target of 16% ('Energy in Ireland 1990-2016', SEAI, December 2017). Furthermore, In March 2019, the Government announced a renewable electricity target of 70% by 2030. The proposed development is likely to be operational before 2030 and would therefore contribute to this 2030 target. More recently, the EPA reported that Ireland is set to fall far short of all of its carbon emissions reduction targets for both 2020 and 2030 despite climate action measures in the National Development Plan (EPA, June 2019).

The Climate Action Plan 2019 (CAP) was published on the 1st of August 2019 by the Department of Communications, Climate Action and Environment. The CAP sets out an ambitious course of action over the coming years to address the impacts which climate may have on Ireland's environment, society, economic and natural resources. This Plan clearly recognises that Ireland must significantly step up its commitments to tackle climate disruption. The CAP identifies a need for 8.2GW of onshore wind generation. Only 3.7GW is in place as of December 2019, therefore Ireland needs to more than double its installed capacity of wind generation. The CAP presents clear and unequivocal support for the provision of additional renewable energy generation and presents yet further policy support for increased wind energy.

Economic Benefits

The proposed wind farm project will be capable of providing power to approx. 58,315 households every year and will result in the net displacement of between approximately 90,000 and 170,000 tonnes of Carbon Dioxide (CO₂) per annum, depending on the fossil fuel source to which it is compared.

The proposed development will have both long-term and short-term benefits for the local economy including job creation (estimated at 100-120 jobs during the construction, operational and maintenance phases of the proposed development), local authority commercial rate payments and a Community Benefit Scheme.

There are substantial opportunities available for areas where wind farms and other types of renewable energy developments are located, in the form of Community Gain Funds. Based on the current proposal, a Community Gain Fund in the region of €10 million will be made available over the lifetime of the project. The value of this fund will be directly proportional to the installed capacity and/or energy produced at the site and will support and facilitate projects and initiatives including youth, sport and community facilities, schools, educational and training initiatives, and wider amenity, heritage, and environmental projects.

Recreational Benefits

In addition to the economic and environmental benefits of the proposed development, there will be potential social and recreational benefits associated with the proposed Recreational Amenity pathway for use by members of the local and wider community alike. The peatland habitat at both Clongawny and Drinagh Bogs is attractive to both locals and visitors to the area because of its history and variety of vegetation. Sections of the new site roads of the proposed development will be developed and promoted for walking and cycling activities. This proposal is based on the current use of the wider area as an informal walking route; where the proposed amenity facilities will allow for a safer and improved visitor experience and allow the site to be more openly available to walkers, trail runners, cyclists and other recreational users. The proposed development will also facilitate linkages to the wider area and to both existing and proposed amenity walkways.

Purpose and Structure of this EIAR

The purpose of this EIAR is to document the current state of the environment in the vicinity of the proposed development site and to quantify the likely significant effects of the proposed development on the environment. The EIAR submitted by the applicant provides the relevant environmental information to enable the Environmental Impact Assessment (EIA) to be carried out by the competent authority.

The EIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of wind energy developments and in their relevant area of expertise. Each chapter of this EIAR has been prepared by a competent expert in the subject matter. The chapters of this EIAR are as follows:

1. *Introduction*
2. *Background to the Proposed Development*
3. *Consideration of Reasonable Alternatives*
4. *Description of the Proposed Development*
5. *Population and Human Health*
6. *Biodiversity*
7. *Ornithology*
8. *Land, Soils and Geology*
9. *Hydrology and Hydrogeology*
10. *Air and Climate*
11. *Noise and Vibration*
12. *Landscape and Visual*
13. *Archaeological/Cultural Heritage*
14. *Material Assets (including Traffic and Transport, Telecommunications and Aviation)*
15. *Interactions of the Foregoing*
16. *Schedule of Mitigation*

A Natura Impact Statement has also been prepared in line with the requirements of the Habitats Directive and will be submitted to the Planning Authority as part of the planning application documentation.

Background to the Proposed Development

This chapter of the Environmental Impact Assessment Report (EIAR) presents information on renewable energy and climate change policy and targets, the strategic planning context for the proposed development, the site selection and design process, a description of the proposed development site and planning history, the assessment of reasonable alternatives, scoping and consultation, and the cumulative impact assessment process.

Energy and Climate Change Targets

Renewable energy development is recognised as a vital component of Ireland’s strategy to tackle the challenges of combating climate change and ensuring a secure supply of energy. The June 2018 ‘*Off Target Report*’ published by the Climate Action Network (CAN) Europe, which ranks EU countries ambition and progress in fighting climate change, listed Ireland as the second worst performing EU member state in tackling climate change. It also stated that Ireland is set to miss its 2020 climate and renewable energy targets and is also off course for its unambitious 2030 emissions target.

The Department of Climate Change, Action & Environment (DCCAE) reported in their ‘*Fourth Progress Report on the National Renewable Energy Action Plan*’ December 2017 that Ireland will achieve 13% of its 16% RES target by 2020. SEAI in their report ‘*Ireland’s Energy Targets – Progress, Ambition & Impacts*’ (April 2016) estimates that Ireland’s inability to achieve its 2020 renewable energy targets will result in fines of between €65 million and €130 million per percentage shortfall on its overall binding target after 2020 until it meets its targets. The latest data available from Eurostat show that as of the 2018 figures, Ireland is still considerably below meeting its 16% target and at the end of 2018 sat at 11.1%.

The SEAI’s ‘*Energy in Ireland 2019*’ report provides the most up to date figures available (from 2018) in relation to energy production and consumption in Ireland. The 2019 report found that wind generation accounted for 28.1% (normalised) of all electricity generated, further, wind energy accounted for 84% of the renewable energy generated in 2018. In relation to the findings of this SEAI report it is clear that wind energy represents the strongest and most deployable renewable energy resource available to reduce dependence on fossil fuels in Ireland. While it is clear that additional deployment is on-going, it is also apparent that it is unlikely that the 2020 targets for renewable electricity generation will be met.

Offaly County Council Development Plan 2014-2020

The Offaly County Development Plan 2014-2020 (CDP) is the principal instrument that is used to manage change in land use in the County. The Plan sets out the Council’s strategic land use objectives and policies for the overall development of the County up to the year 2020 and beyond. A core strategy of the plan surrounds the need for adapting to climate change, it is stated that:

“To ensure that development promoted, supported or facilitated by the Development Plan provides for the adaptation to climate change and the promotion of renewable energy where possible including the increased risk of flooding.”

The Plan, through its inclusion of an Energy Strategy, acknowledges the importance of energy to the local economy ensuring that the County is positioned in order to compete for future investment in

generation capacity. The County Development Plan 2014-2020 sets a number of objectives in relation to energy/ renewable energy which include the following:

- RDP-08: It is Council policy to support the development of renewable energy in rural areas, where it is considered appropriate i.e. where it is demonstrated that such development will not result in significant environmental effects. Such development will be assessed on a case-by-case basis.
- RDP-09: It is Council policy to encourage and facilitate the development of local and community based renewable energy projects in the county, notwithstanding their suitability and additional considerations such as location, nature of use, compliance with relevant guidelines and scale, where it can be demonstrated that such proposals are feasible.
- RDP-11: It is Council policy to encourage expansion and employment in industries such as agriculture, horticulture, forestry, peatlands, food, crafts, tourism and energy.

In relation to energy the following objectives have been set to aid the plan in meeting its goals during the duration of the development plan:

- **EP-01:** It is Council policy to support national and international initiatives for limiting emissions of greenhouse gases and to encourage the development of renewable energy sources.
- **EP-02:** It is Council policy to facilitate the continual development of renewable energy sources having regard to the proper planning and sustainable development of the area concerned, the protection of amenities, landscape sensitivities, European Sites, biodiversity, natural heritage, and built heritage, and where such proposals comply with policy contained in the County Development Plan, in the interests of proper planning and sustainable development.
- **EP-03:** It is Council policy to encourage the development of wind energy in suitable locations, on cutaway bogs within the wind energy development areas open for consideration identified in Map 3.2, in an environmentally sustainable manner and in accordance with Government policy, having particular regard to the Wind Energy Strategy for the County and Section 3.5.1, which states that appropriate buffers should be provided, which shall be a minimum of 2km from Town and Village Cores, European designated sites, including Special Areas of Conservation (SAC) and Special Protection Areas (SPA), and national designations, Natural Heritage Areas (NHA). Wind Energy developments on cutaway bogs should generally be developed from the centre out.
 - The Area around Corracullin Bog, (Area 4 in Wind Energy Strategy), is omitted from the Wind Energy Development Area.
- **EP-05:** It is Council policy that applications for wind energy development outside of the wind energy development areas open for consideration identified in Map 3.2 will not normally be permitted except when it can be demonstrated that the proposal falls into the following category:
 - Category A: Single Turbines that are sited close to and specifically relate to the operations of an industrial/commercial premises or a school, hospital or other community-related premises. Supporting evidence must be provided detailing that the development will only facilitate and is only related to the operation of the business or community facility.
 - Each proposal within this category will be open for consideration outside of the wind energy development areas and subject to site specific assessment in accordance with relevant guidance.
- **EO-01:** It is an objective of the Council to achieve a reasonable balance between responding to government policy on renewable energy and in enabling the wind energy resources of the county to be harnessed in an environmentally sustainable manner. This will be implemented having regard to the Council's Wind Energy Strategy as follows:

- In Areas open for consideration for Wind Energy Development, as identified in Map 3.2;
- In all other areas, Wind Energy Developments shall not normally be permitted except as provided for under exemption provisions and as specifically described in Section 5.4 of the Wind Energy Strategy and Policy EP-05.

Scoping and Consultation

A comprehensive scoping and consultation exercise was undertaken during the preparation of the EIAR. This included:

- *Circulation of a detailed Scoping Document, providing details of the application site, the proposed development and the proposed scope of the EIAR.*
- *Pre-planning meetings with Offaly County Council and An Bord Pleanála*
- *Public consultation including the appointment of a nominated Community Liaison Officer, Community Information Sessions, house-to-house calls, meetings and dissemination of information packs and leaflets.*

Section 2.6 of the EIAR describes the detailed community consultation that has been ongoing in the area around the proposed development site.

Consideration of Reasonable Alternatives

Article IV of the EIA Directive as amended by Directive 2014/52/EU states that the information provided in an Environmental Impact Assessment Report (EIAR) should include a description of the reasonable alternatives studied by the developer which are relevant to the project and its specific characteristics and an indication of the main reasons for the option chosen, taking into account the environmental effects. The consideration of alternatives typically refers to alternative design, technology, location, size and scale. A 'Do Nothing Scenario' i.e. an outline of what is likely to happen to the environment should the Project not be implemented, should also be included.

In implementing the 'Do-Nothing' scenario i.e. if the proposed development were not to proceed, the site would continue to be managed under the requirements of the relevant IPC licence, and existing commercial forestry, telecommunications and wind measurement would continue. The rail lines that supply peat to Derrinlough Briquette Factory would continue to be used until the manufacture of peat briquettes ceases.

When peat extraction activity ceases, a Rehabilitation Plan will be implemented in accordance with the IPC licence requirements, to environmentally stabilise the site through encouragement of 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).

However, the opportunity to capture a significant part of County Offaly's renewable energy resource would be lost, as would the opportunity to contribute to meeting National 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 Recreational Benefits outlined above would be lost as well as the potential connectivity with Lough Boora Parklands. On the basis of the positive environmental effects arising from the project, the do-nothing scenario was not the chosen option.

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 identifies 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, 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 national and regional context as being suitable for this type of development. Bord na Móna conducted a technical review of lands which are either cut away or will be cut away before 2030. A review of the Offer Process Application Information that is provided on the publicly available EirGrid website was also undertaken. Following a site-specific assessment it was determined that Derrinlough (Clongawny/Drinagh) is one of the suitable sites for wind energy development with a low potential for environmental effects and proximity to a potential grid connection.

Solar energy is an alternative source of renewable electricity generation that could be considered for this site; however, to achieve the same energy output, a solar development would require a significantly larger footprint. In addition, a solar development would have a higher potential environmental effect on Hydrology and Hydrogeology, Traffic and Transport (construction phase) and Biodiversity (habitat loss). For this reason, wind energy is considered the most suitable renewable electricity generation option for the site.

It is proposed to install 21 turbines, each with a potential 3-5-megawatt (MW) power output range, achieving an approximate 88.2 MW output. The turbine model to be installed on the site will be the subject of a competitive tendering process with a maximum height of 185m from top of foundation to blade tip. A similar wind energy output could also be achieved on the site by using smaller turbines (for example 2.5 MW machines); however, this would necessitate the installation of over 35 turbines. This greater turbine quantity would result in the wind farm occupying a greater footprint, with a larger amount of supporting infrastructure required (i.e. roads etc.), increasing the potential for negative environmental impacts to occur on biodiversity, hydrology and traffic and transportation. Likewise, smaller turbines would fail to make the most efficient use of the wind resource passing over the site. The 21 turbines with a maximum 185m tip height proposed for Derrinlough takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the site. The 21-turbine layout selected for the site has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines.

Alternatives to the layout of the 21 turbines and ancillary infrastructure were also considered for the proposed Derrinlough Wind Farm. The final design takes account of all site constraints (e.g. ecology, ornithology, hydrology, peat depths etc.) and design constraints (e.g. setback distances from houses and third-party lands/infrastructure and distances between turbines on-site etc.). It also takes account of the results of all site investigations and baseline assessments that have been carried out during the EIAR process in addition to feedback from the relevant statutory and non-statutory organisations, local authorities and ongoing discussions with the local community.

Alternative transport routes for the delivery of wind turbine components were assessed as part of the design of the proposed development. The proposed route was considered to be the preferred route given the limited road upgrade work required and its proved suitability for the transport of turbine components for the recently constructed Meenwaun Wind Farm, located directly to the southwest of the proposed development site.

The site layout aims to avoid any environmentally sensitive areas. Where loss of habitat occurs in the site, this has been mitigated with the proposal of enhancement lands. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential environmental effects and risk associated with this. The best practice design and mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the site and any identified environmental receptors. The alternative is to either not propose these measures or propose measures which are not best practice and effective and neither of these options is sustainable.

The final design is considered the optimal layout given it has the least potential for environmental effects.

Description of the Proposed Development

The overall layout of the proposed development is shown on Figure 4.1. This drawing shows the proposed locations of the wind turbines, electricity substation, construction compounds, internal roads layout and the site entrances. Detailed site layout drawings of the proposed development are included in Appendix 4.1 to this EIAR.

The 21 no. proposed wind turbines will have a tip height of up to 185 metres. Within this size envelope, various configurations of hub height, rotor diameter and blade tip height may be used. The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed a tip height of up to 185 metres above top of foundation. Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the site will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times. The turbines will be multi-ply coated to protect against corrosion. It is proposed that the turbines would be of an off-white or light grey colour so as to blend into the sky background.

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level on a granular sub-base after the excavation of soil and peat. The size of the foundation will be determined by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. The turbine foundation transmits any load on the wind turbine into the ground. Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are typically used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position.

To provide access within the site of the proposed development, to connect the wind turbines and associated infrastructure, approximately 29.3 kilometres of access roads will need to be constructed including the upgrade 450m of existing access road.

Two permanent, pre-cast concrete underpasses are proposed as part of the proposed development. The first underpass will traverse beneath the N62, immediately north of Derrinlough Briquette Factory. This underpass will provide amenity connectivity between Clongawny and Drinagh Bogs and will also be used during the operational phase to provide access to facilitate wind farm maintenance. A second underpass is proposed in Clongawny bog beneath an existing Bord na Móna railway line. This underpass will also be used for amenity purposes and for wind farm maintenance during the operational phase.

It is proposed to construct an electricity substation within the site of the proposed development as shown in Figure 4.1. The proposed substation site is located within an area adjacent in the north eastern

section of the site off the proposed new site road and just south of the north eastern site entrance off the R357 Regional Road.

Two substation control buildings will be located within the substation compound. The wind farm control buildings will include staff welfare facilities for the staff that will work on the proposed development during the operational phase of the project. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by an appropriately consented waste collector to wastewater treatment plants.

Each turbine will be connected to the on-site electricity substation via an underground 33 kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the onsite substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts approximately 1.3 metres below the ground surface, along the sides of or underneath the internal roadways. A connection between the proposed development and the national electricity grid will be necessary to export electricity from the proposed wind farm. This connection will originate at the proposed onsite substation and will be connected to the national grid via either an underground grid connection cable or overhead line which will connect into the existing 110 kV transmission line located approximately 300m north of the substation. Planning permission is being sought for the overhead line and underground cabling options, however, only one option will be used to connect the proposed development to the national electricity grid.

Two permanent anemometry masts are proposed as part of the proposed development. The anemometry masts will be equipped with wind monitoring equipment at various heights. The masts will be slender free standing structures up to 120 metres in height.

Five temporary construction compounds are proposed as part of the proposed development. The construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors.

It is estimated that approximately 392,684m³ of peat and spoil will be excavated during the construction of the proposed development. This peat and spoil will be managed by means of placement/spreading along site the proposed infrastructure elements, where suitable. Approximately 735,275m³ of crushed is required for the construction of the proposed development. It is proposed to source stone from local, authorised quarries.

Three entrances are proposed for the construction stage of the proposed development in order to transport turbine components, materials and equipment to the site. The entrance can be described as follows:

- Existing entrance off the N62 to Drinagh Bog;
- Existing entrance off the N62 to Clongawny Bog; and
- Existing entrance off the R357 which connects Drinagh and Noggus Bog.

It is proposed that the large wind turbine plant will be delivered via the M6 before turning south onto the N52 at Junction 5 (Tullamore/Kilbeggan). The route follows the N52 south, bypassing Tullamore to the east and passing through the settlements of Blue Ball, Kilcormac and Five Alley. Deliveries will turn right onto the N62 (at the junction known as Kennedy's Cross) and will proceed northwards towards Cloghan to the proposed site entrances, immediately north of Derrinlough Briquette Factory. A new temporary arrangement will be required at Kennedy's Cross, located in the townland of Ballindown, (junction of the N52 and N62 National Secondary Roads), comprising construction of a new junction bypass road across third party lands, to facilitate the delivery of turbine components and other abnormal loads. The proposed new road will measure approximately 160 metres in length.

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the proposed development. There is an existing drainage system and surface water discharges from the site which are regulated by the Environmental Protection Agency (Licence Ref. P0500-01). The proposed development drainage design for the proposed development has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the proposed development and turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the proposed development.

It is estimated that the construction phase will take approximately 24 to 30 months from starting onsite to the full commissioning of the wind farm. The construction phase can be broken down into three main phases, 1) civil engineering works: 18 months, 2) electrical works: 18 months, and 3) turbine erection and commissioning: 9 months.

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

The wind turbines proposed as part of the proposed development are expected to have a lifespan of approximately 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the proposed development may be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid.

Population and Human Health

One of the principle concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the construction and operation of a development. The key issues examined in this chapter of the EIAR include population, human health, employment and economic activity, land-use, residential amenity, community facilities and services, tourism, property values, shadow flicker, noise and health and safety.

The wind farm site is located approximately 3km east of Banagher town and 2km south of Cloghan village, in which the main services are located. The nearby town of Birr lies approximately 7km south of the proposed development where local amenities including a community centre, church and shop are located. There are no key identified tourist attractions pertaining specifically to the site of the proposed development itself although it is proposed to develop a recreational and amenity facility as part of the Proposed Development.

The Study Area for the Population and Human Health assessment was defined by the 7 No. District Electoral Division (DED)s within and adjacent to the development site. The population of the DEDs within the Study Area increased by 1.6% between 2011 and 2016, growing from 4,530 to 4,601 persons, respectively, with the rate of population change unevenly distributed between the DEDs. The levels of employment within the 7 No. DEDs in the 'Employer/Manager', 'Higher Professional' and 'Non-Manual' categories in the Study Area were lower than those recorded for the State and County Offaly,

while those recorded within the ‘Semi-Skilled’, ‘Un-Skilled’, ‘Farmer’, ‘Agricultural Worker’ and ‘Own Account’ categories were higher. The highest level of employment within the Study Area was recorded in the ‘Other’ category.

As stated above, approximately 100-120 jobs could be created during the construction, operation and maintenance phases of the proposed development with most construction workers and materials sourced locally, thereby helping to sustain employment in the construction trade. This will have a Short-Term Significant Positive Impact.

There is currently no published credible scientific evidence to positively link wind turbines with adverse health effects. The main publications supporting the view that there is no evidence of any direct link between wind turbines and health are summarised in Chapter 5 of this EIAR. Although there have been no empirical studies carried out in Ireland on the effects of wind farms on property prices, it is a reasonable assumption based on the available international literature that the provision of a wind farm at the proposed location would not impact on the property values in the area.

Shadow flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in a nearby property. An indoor phenomenon, it may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine’s blade. Shadow flicker effect lasts only for a short period of time and happens only in certain specific combined circumstances. Current guidelines recommend that shadow flicker at neighbouring dwellings within 500 metres of a proposed turbine location should not exceed a total of 30 hours per year or 30 minutes per day. The closest occupied dwelling is 762m from the nearest proposed turbine, with 82 dwellings located within 1.5km of the turbine locations. The potential flicker that will occur at houses located within the area surrounding the proposed development was calculated using the WindFarm software package and a regional sun factor of 26.6% was applied. Of the 82 No. residential properties modelled, it is predicted that 34 No. properties may experience daily shadow flicker in excess of the 2006 DoEHLG guideline threshold of 30 minutes per day. However, this prediction does not consider wind direction or screening provided by intervening vegetation and topography.

Where shadow flicker exceedances are experienced a site visit will be undertaken firstly to determine the level of occurrence, existing screening and window orientation. If annoyance is found, suitable mitigation measures as outlined in Chapter 5 will be employed at the potentially affected properties to ensure that the current adopted 2006 DoEHLG guidelines are complied with at any dwelling within the 1.5km study area. The same mitigation strategies also demonstrate that the proposed Derrinlough Wind Farm can be brought in line with the shadow flicker requirements of the Draft Revised Wind Energy Development Guidelines (2019) should they be adopted while this application is in the planning system.

Impacts on human beings during the construction and operational phases of the proposed development are described in Chapter 5 in terms of health and safety, employment and investment, population, land-use, noise, dust, traffic, tourism, residential amenity, renewable energy production and reduction in greenhouse gas emissions, shadow flicker and interference with communication systems. Where a negative impact was identified, the appropriate mitigation measures will be put in place to ensure that there will be No Adverse Impacts on human beings within the Study Area.

Following consideration of the residual effects (post-mitigation), the proposed development will not result in any significant effects on population and human health. Provided that the proposed wind farm development is constructed and operated in accordance with the design, best practice and mitigation that is described within this application, significant effects on population and human health are not anticipated at international, national or county scale.

Biodiversity

The Biodiversity Chapter assesses the likely significant effects (both alone and cumulatively with other projects) that the proposed development may have on Biodiversity and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified.

Multidisciplinary walkover surveys and detailed botanical surveys were undertaken on the 21st June 2018, 28th September 2018, 21st and 22nd August 2019, 18th and 19th September 2019 and 5th December 2019. The majority of the survey timings fall within the recognised optimum period for vegetation surveys/habitat mapping, i.e. April to September (Smith et al., 2011). A comprehensive walkover of the entire site was completed.

The habitats on the proposed development site were the subject of a detailed survey and assessment by Bord na Móna ecologists and a habitat map was produced of the entire landholding of the proposed development. This habitat mapping and assessment was undertaken following the Bord na Móna habitat classification scheme and was cross referenced with 'A Guide to Habitats in Ireland' (Fossitt, 2000).

The study area comprises two large cutover raised bogs. Some areas of the site have been out of commercial peat production by Bord na Móna for a significant period of time and thus, vegetation dominated primarily by birch scrub, common cottongrass and marsh arrowgrass, has regenerated over much of these areas. Small areas/remnant of uncut raised bog occur at various locations at its edges of the site, although these areas occur outside of the development footprint.

The construction of the proposed windfarm and associated infrastructure will result in the direct loss of approximately 32.38 hectares (1.95% of the total study area) of revegetated cutover bog which is developing as pioneer poor fen, heath type habitats, bog woodlands and scrub. The areas of uncut raised bog and natural oak, ash, and hazel woodland habitats have been entirely avoided in the design of the project with no potential for any effect thereon. There will be no significant habitat loss associated with the proposed development and a Biodiversity Management Plan and Lepidoptera Management Plan have been prepared. Following the implementation of these Management Plans, the proposed development has the potential to result in Significant Positive Impacts on biodiversity within the study area.

In general, given the highly modified and bare nature of the exposed peat, limited suitable habitat occurs on site for protected faunal species. A number of badger setts were recorded within the study area but were restricted to the peripheries of the site within heavily vegetated stands of semi-mature trees. Evidence of fox, red deer, red squirrel, pine marten, Irish hare and otter were also recorded within the site. In addition, detailed bat and fisheries assessments have been undertaken as part of the detailed baseline assessment, detailed results of which are provided in technical appendices to this EIAR. No evidence of significant populations of these species at more than a local level was recorded. No signs of any additional protected fauna were recorded within the study area during the field surveys.

No Significant Effects on surface water quality, groundwater quality or the hydrological/hydrogeological regime are identified for the either construction or operational periods of the wind farm development.

Provided that the proposed development is constructed and operated in accordance with the design, and best practice and mitigation measures described within this application, significant impacts on ecology are not anticipated.

Ornithology

The Ornithology chapter assesses the likely significant effects that the proposed development may have on bird species. Firstly, a brief description of the proposed development is provided. This is followed by a comprehensive description of the desk study, survey methodologies and assessment approach followed in order to obtain the information necessary to complete a thorough assessment of the

potential effects of the proposed development on bird species. The survey data is presented in full in the ELAR Appendices, with a summary of the field survey results presented within the chapter. Analysis and evaluation of the results is then provided, which discusses the ecological significance of the birds recorded within the study area. Next the Key Ornithological Receptors (KORs) were determined using the NRA evaluation guidelines as described in the Chapter. The identification of Key Ornithological Receptors and the assessment of effects followed a precautionary approach.

The Sensitivity Determination of the KORs was calculated using guidance outlined in Percival (2003). The potential effects to the KORs, resulting from the proposed development are then described in terms of the construction, operation and decommissioning phases of the development. An accurate prediction of the effects is derived following a thorough understanding of the nature of the proposed development along with a comprehensive knowledge of bird activity within the study area.

The potential for effects on designated sites is fully described in the Natura Impact Statement (NIS) that accompanies this application. The findings presented in the NIS conclude that the proposed development will not have an adverse impact on any European Sites, either alone or in combination with other plans or projects.

Based on the detailed assessment, it is considered that the potential effects of the proposed development upon birds will not be significant. Effects associated with habitat loss and fragmentation, disturbance, displacement, collision risk and cumulative effects have been assessed to be no greater than Long-Term Slight Negative Effect (EPA, 2017), for all species with the exception of lapwing.

A Habitat Enhancement Plan has been proposed for lapwing, waterfowl and waders and is fully described within the Chapter and accompanying Appendix 7-8. With the successful implementation of the Habitat Enhancement Plan, the predicted impacts on lapwing will reduce from Moderate to Long Term Slight Effect (EPA, 2017). The implementation of the plan will also have Positive Effects on other KOR species.

The implementation of the prescribed mitigation measures will render any potential effects on avian receptors to Low Significance. In conclusion, No Significant Effects as a result of the proposed development are foreseen on KORs of the study area at any stage of construction, operation or decommissioning, either in isolation or cumulatively with other surrounding windfarms.

Land, Soils and Geology

This chapter assesses the likely significant effects that the proposed development may have on land, soils and geology and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified.

Based on the peat depth information for the site, the peat varied in depth from 0 to 4.7m with an average of 1.1m. The peat thickness at proposed infrastructure footprints is generally less than 2m. The deeper peat areas across the two bogs have been avoided in the proposed wind farm layout. The peat deposits at the site are underlain by intermittent shell marl deposits and more common grey lacustrine deposits. The lacustrine deposits are underlain by glacial till. Glacial tills are underlain by limestone bedrock.

The proposed development will typically involve removal of peat and subsoils (spoil) for access roads, internal road network, internal cable network, hardstanding emplacement, turbine foundations, substation, crane hardstands, compounds, met mast and the grid connection trench.

Estimated volumes of peat and spoil to be excavated are in the region of 205,260m³. Excavated peat and spoil will also be used for reinstatement and landscaping works as close to the extraction point as

possible. The handling and storage of peat and spoil will be done in accordance with the Peat and Spoil Management Plan which is included as Appendix 4.2 to the EIAR.

Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Measures to prevent peat and subsoil erosion during excavation and reinstatement will be undertaken to prevent water quality impacts.

A Geotechnical and Peat Stability Assessment was undertaken for the site (Appendix 8.1) and it demonstrates an acceptable margin of safety, that the site is suitable for the proposed wind farm development and is considered to be at low risk of peat failure. A number of control measures are given in the peat stability assessment to manage all risks associated with peat instability.

No Significant Impacts on the land and soils and geology environment are anticipated during construction, operation, or during decommissioning phases of the proposed development.

The Land, Soils and Geology Assessment confirms there will be no cumulative effects on land soil and geology environment as a result of the proposed development.

Hydrology and Hydrogeology

This chapter assesses the likely significant effects that the proposed development may have on hydrology and hydrogeology and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified.

The surface of Drinagh bog is drained by a network of north / south orientated drains that are typically spaced every 15 to 20m. Larger arterial drains also run north / south, and these connect the smaller field drains. Surface water outflows from the bog are located at the northwest and southeast. Both outfalls are drained by gravity. There is also one pumped outfall along the northern boundary of the bog. There is also one internal pumping station that raises water from a low point within the bog basin.

The surface of Clongawny bog is drained by a network of northeast / southwest orientated drains that are typically spaced every 15 to 20m. Larger arterial drains run northwest-southeast which connect the smaller field drains. Drains here typically slope gently towards perimeter settlement ponds and surface water outfalls. Surface water outflows are located at the north and north-eastern edges, and also at the south and southwestern boundaries of the site. All but the northern outfall, which is pumped, drain by gravity. The northern outfall is a pumping station.

Regionally, the proposed wind farm development site is located in the River Shannon surface water catchment. The proposed development site drains to the northwest via the Island River, Brosna River, and the Little River, and to the south-west to the Rapemills river. All drainage pathways discharge to the River Shannon.

During each phase of the wind farm development (construction, operation and decommissioning) a number of activities will take place on the proposed Derrinlough wind farm site, some of which will have the potential to significantly affect the hydrological regime or water quality at the site or its vicinity. These significant potential impacts generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds, with the former having the most potential for impact.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant adverse impacts on water quality and downstream designated sites. A self-imposed 50m stream and lake buffer was used during the design of the proposed development, thereby avoiding sensitive hydrological features.

The surface water drainage plan will be the principal means of significantly reducing sediment runoff arising from construction activities and to control runoff rates. The key surface water control measure is

that there will be no direct discharge of wind farm runoff into local watercourses. This will be achieved by avoidance methods (i.e. stream buffers) and design methods (i.e. surface water drainage plan). Preventative measures also include fuel and concrete management and a waste management plan which will be incorporated into the Construction and Environmental Management Plan.

Overall the proposed development presents No Significant Impacts to surface water and groundwater quality provided the proposed mitigation measures are implemented.

A hydrological assessment of potential impacts on local designated sites was undertaken, and it is concluded using physical and scientific data and by use of proven mitigation measures, that No Significant Adverse hydrological impacts will occur at designated sites as a result of the proposed wind farm development.

No Significant cumulative hydrological impacts on any of the regional surface water catchment or groundwater bodies are anticipated from the proposed Derrinlough wind farm.

Air and Climate

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the construction, operation and decommissioning of the proposed development.

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the proposed development lies within Zone D, which represents rural areas located away from large population centres.

Due to the non-industrial nature of the proposed development and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power stations. Harnessing more energy by means of wind farms will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor short term or temporary indirect emissions associated with the construction of the wind farm include vehicular and dust emissions.

A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3 of the EIAR) and includes dust suppression measures. In addition, turbines and construction materials will be transported to the site on specified haul routes only. The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as necessary.

Climate Change and Carbon Balance Calculations

Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer

weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

In June 2019, the EPA published an update on Ireland’s Greenhouse Gas Emission Projections to 2040. The report includes an assessment of Ireland’s progress towards achieving its emission reduction targets out to 2020 and 2030 set under the EU Effort Sharing Decision (Decision No 406/2009/EU) and Effort Sharing Regulation (Regulation (EU) 2018/842).

Projected greenhouse gas emissions up to 2040 are obtained using two scenarios; ‘With Existing Measures’ and ‘With Additional Measures’. The ‘With Existing Measures’ scenario assumes that no additional policies and measures, beyond those already in place by the end of 2017 are implemented. The ‘With Additional Measures’ scenario assumes the implementation of the “With Existing Measures” scenario and further implementation of the governments renewable and energy efficiency policies including those set out in the National Renewable Energy Action Plan (NREA), the National Energy Efficiency Action Plan (NEEAP) and the National Development Plan 2018-2027.

The EPA Emission Projections Update notes that Ireland’s non-Emissions Trading Scheme (ETS) emissions are projected to be 5% and 6% below 2005 levels in 2020 under the ‘With Measures’ and ‘With Additional Measures’ scenarios, respectively. The target for Ireland is a 20% reduction. Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 10 Mt CO₂ (metric tonnes of Carbon Dioxide) equivalent under the ‘With Measures’ scenario and 9 Mt CO₂ equivalent under the ‘With Additional Measures’ scenario.

The report concludes:

- *“Projections indicate that Ireland will exceed the carbon budget over the period 2021-2030 by 52-67Mt CO₂ equivalent with the gap potentially narrowing to 7-22 Mt CO₂ equivalent if both the ETS and LULUCF flexibilities described in the Regulation are fully utilised.”*
- *“To determine compliance under the Effort Sharing Decision, any overachievement of the binding emission limit in a particular year (between 2013 and 2020) can be banked and used towards compliance in a future year. However, even using this mechanism Ireland will still be in non-compliance according to the latest projections.”*
- *“Ireland still faces significant challenges in meeting EU 2030 targets in the non-ETS sector and national 2050 reduction targets in the electricity generation, built environment and transport sectors. Progress in achieving targets is dependent on the level of implementation of current and future plans.”*

The carbon balance of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When development such as wind farms are proposed for peatland areas, there will be direct impacts and loss of peat in the area of the development footprint. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO₂. It is essential therefore that any wind farm development in a peatland area saves more CO₂ than is released.

Bord na Móna developed a methodology based on their extensive experience for calculating carbon losses and savings from proposed wind farm development. The methodology was informed by the Scottish Governments Carbon Calculator and other relevant information sources such as:

- Multiyear greenhouse gas balances at a rewetted temperate peatland. (Wilson et al., 2016);
- Greenhouse gas Emission Factors. (Wilson et al., 2016);
- Derivation of GHG emission factors for peatlands managed for extraction in the ROI and the UK. (Wilson et al. 2015); and

- The Effect of Management Strategies on Greenhouse Gas Balances in Industrial Cutaway Peatlands in Ireland (The CARBAL Report) (Wilson, D. and Farrell, E.P., 2007).

This was used to assess the effects of the proposed wind farm in terms of potential carbon losses and savings taking into account peat removal, drainage and operation of wind farm. The methodology reflects the specific nature of the cutaway peat lands upon which the project is proposed to be located. The model calculates the total carbon emissions associated with the proposed wind farm development including manufacturing of the turbine technology, transport, construction of the development and carbon losses due to peatland disturbance. The model also calculates the carbon savings associated with the proposed wind farm development.

Based on the Bord na Móna model calculations as presented above, 192,665 tonnes of CO₂ will be lost to the atmosphere due to changes in the peat environment, changes in the cycling of mid-merit gas-fired generation units and due to the construction, operation and decommissioning of the proposed development. This represents a fraction (EU FFC – 4.2%) of the total amount of carbon dioxide emissions that will be offset by the proposed wind farm project. The volume of CO₂ that will be lost to the atmosphere will be offset by the proposed development between 1 and 2 years of operation, depending on the fuel source to which it is compared.

Construction of the proposed development will have a Short-Term, Imperceptible Negative Effect as a result of greenhouse gas emissions from construction plant and vehicles. Operation of the proposed development will have a Direct Long-Term Moderate Positive Impact on climate as a result of reduced greenhouse gas emissions.

Noise and Vibration

AWN Consulting Limited has been commissioned to conduct an assessment into the likely environmental noise and vibration impacts of the proposed Derrinlough wind farm development (the 'Proposed Development').

The background noise environment in the absence of existing operational wind farm developments has been established through noise monitoring surveys undertaken at several noise sensitive locations (NSL's) 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). The results of the background noise survey have been used to derive appropriate noise criteria for the development in line with the guidance contained in 'Wind Energy Development Guidelines for Planning Authorities 2006.

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 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 ELAR Chapter, it is not expected that there will be any significant noise and vibration impacts associated with the construction phase and the likely noise from construction activity at the nearest Noise Sensitive Locations (NSL's) is expected to be well below recommended threshold values. The associated construction noise and vibration impacts are not expected to cause any significant effects.

Based on detailed information on the site layout, the likely turbine noise emissions and turbine hub height for the proposed development, a series of ‘worst-case’ turbine noise prediction models have been prepared for review. The predicted turbine noise levels have been calculated at all NSL’s in accordance with the IOA GPG recommendations. The predicted turbine noise levels associated with the Proposed Development in isolation are predicted to be well within the best practice noise criteria curves recommended in Irish guidance document ‘Wind Energy Development Guidelines for Planning Authorities 2006. However, the noise modelling calculations identified 5 no. NSL’s where the contribution of the Derrinlough turbines could potentially result in a cumulative turbine noise level that exceed the noise criteria curves (i.e. the total turbine noise levels from all permitted and proposed wind farm developments in the area). This assessment has demonstrated that the turbine noise emissions of the Proposed Development can be attenuated for the 5 no. NSL’s identified in the calculations such that the Proposed Development will operate in accordance with best practice guidance and in compliance with relevant noise criteria curves. Attenuation of the proposed Derrinlough turbines, if required, will be achieved using low noise operating modes applied to the selected turbine technology under certain wind speeds and directions. Therefore, it is not considered that a significant effect is associated with the Proposed Development.

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

In summary, the noise and vibration impact of the proposed development is not significant considering national guidance for wind farm developments.

Landscape and Visual

This chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential landscape and visual impacts of the proposed Derrinlough Wind Farm. The emphasis is on the likely significant direct and indirect effects of the proposed development. The chapter outlines the assessment methodology and a description of the existing landscape based on relevant guidance. It includes a description of the landscape policy with specific reference to wind energy and the study area in which the proposed development site is located.

Landscape Assessment

The assessment found that there will be No Adverse Effects on Landscape designations in Counties Tipperary and Galway. Of the County Offaly Areas of High Amenity only the nearest ‘Lough Boora Parklands’ will experience landscape effects.

The majority of Co. Offaly protected views and scenic routes within the study area will not experience landscape or visual effects. Those with predicted visibility of the proposed turbines, V10, V11, V12, V16 and V17 as well as the two scenic amenity routes, residual visual effects assessed from carefully selected viewpoints range from ‘No Effect’ to ‘Moderate’.

In terms of landscape character, the greatest landscape effects (“Significant”) will be experienced in the provisional LCA for Offaly *Central Wetlands*, where the turbines will be located. However, these are mitigated by site design and the characteristics of the site and surrounds which are typical of the LCA. Any other effects on other LCAs would be indirect, as the proposed development might be visible within the LCAs but located outside those other LCAs.

Although, it was found that the proposed turbines would add to the cumulative landscape status, the character of the individual LCAs in terms of wind energy would only change in the provisional Offaly LCA in which the turbines are proposed.

Visual Assessment

The visual impact assessment was based on viewpoints. These were identified after compiling a list of key visual receptors within the study. A preliminary visual receptor assessment excluded those visual receptors that showed no theoretical visibility on the Zone of theoretical Visibility mapping or during site visits alongside designated views whose focus was in the opposite direction of the site. All other key visual receptors were selected as viewpoint locations.

The visual assessment concluded that residual visual effects of “Moderate” was deemed to arise at three of the 16 viewpoint locations. All other viewpoints were assessed as resulting in Slight (7), Not Significant (5). At one viewpoint no visual effect was found.

Furthermore, it was shown that although the ZTV mapping shows widespread theoretical visibility, actual visibility in this generally flat terrain is restricted by the amplified effects of localised screening and changes in local topography.

The cumulative visual effects are considered acceptable, as from most viewpoints there is clear visual cohesion between the proposed turbines and other wind energy developments and the difference in scale or design does not contrast excessively. When compared to the nearest existing turbines, the proposed development is at a lower level, thus there is no great difference in terms of turbine height between the existing and proposed turbines when seen alongside each other.

Archaeological, Architectural and Cultural Heritage

This chapter comprises an assessment of the potential impact of the proposed development on the Cultural Heritage resource. Cultural Heritage includes archaeology, architectural heritage and any other tangible assets. The assessment was based on GIS based mapping, ZTV and Viewshed analysis to assist with the assessment of impacts on setting followed by a desktop analysis of all baseline data and a comprehensive programme of field inspection of the proposed infrastructure within the proposed development site boundary.

Twenty-eight recorded monuments are located within the proposed development site boundary, 14 of which are now redundant records. The wind farm layout has taken their location into consideration in that no RMPs are within the footprint of any proposed infrastructure; therefore, No Direct Impacts to any of the aforementioned sites will occur.

The archaeological potential of the bog is considered to be high taking into consideration the RMPs within the Clongawny and Drinagh bogs, the stray finds spots, evident from the National Museum topographical files, as well as the Mesolithic site of Lough Boora only 6km from the nearest proposed turbine. The discovery of Early Bronze Age activity and a Neolithic stone axe in the nearby Meenwaun windfarm (discovered during archaeological testing and monitoring during construction) is further evidence of human activity in the immediate vicinity of the proposed development site. The walkover survey did not reveal any further archaeological features either on the field surfaces or within drains examined. The overgrown nature of the bog in some areas is somewhat limiting in terms of the discovery of new finds/features. The bogs were subject to peatland surveys in the 1990s and again in the 2009. The re-assessment survey in 2009 had also noted the overgrown nature of the bog and the number of sites had diminished at this stage. The milling and peat reduction that has happened in the intervening period is likely to have removed any surviving features on the field surfaces.

Peat depth data for the bogs suggests that the remaining peat depths vary significantly from 0m up to 4.7m. The impacts on potential unknown sub-surface features is addressed by means of pre-development archaeological testing and monitoring.

Indirect effects on the setting of National Monuments within 10km, RMPs within 5km and RPS/NIAH within 5km were included in order to assess impacts on setting in the wider landscape. Viewshed

analysis and a review of the ZTV was undertaken to establish the nature and degree of impacts on the setting of National Monuments. These potential impacts are considered to be ‘slight’ to ‘not significant’. Impacts to setting of RMPs within 5km was undertaken and this included 116 monuments within 5km, the majority occurring between 4 and 5km of the nearest proposed turbine. Impacts to RMPs in the wider setting is considered to be ‘slight-moderate’. Impacts to built heritage within 5km of the proposed turbines is also considered to be ‘slight-moderate’ since none are located within the immediate vicinity.

The substation and grid connection works were also assessed and included in the assessment. Mitigation measures in the form of site monitoring of the construction works is recommended. No known documented cultural heritage features are located within the footprint of the substation and grid connection works. The only junction accommodation works that will take place to facilitate turbine delivery are at Kennedy’s Cross in a greenfield site. No RMPs or any other cultural heritage features are located within its footprint. Archaeological monitoring at the construction stage is recommended.

An assessment of cumulative impacts was also undertaken taking into consideration projects within 20km of the proposed development. This included all permitted, proposed and existing turbines as well as quarries which will be utilised to provide stone to the Derrinlough wind farm. No Direct Cumulative Impacts will occur. Some increases in impacts to the visual setting of some cultural heritage sites will occur taking into consideration all turbines (if constructed).

Material Assets

Traffic and Transport

The traffic and transport assessment of the proposed development considers the effects that traffic generated by the proposed development, including the abnormal-size vehicles required to deliver the turbine plant equipment, would have on the surrounding highway network. It should be noted that abnormal weight loads are not a feature of the turbine delivery vehicles. They are abnormal in size only. All construction and delivery vehicles for the proposed development will be subject to the standard axle weight requirements set out under Road Traffic Regulations and therefore the loadings from construction traffic will not exceed the relevant standards.

An abnormal size load delivery route is proposed as follows: From the M6 Motorway turnoff onto the N52 at Kilbeggan, before heading southbound on the N52 towards Tullamore for approximately 8km. The route then bypasses Tullamore on the N52 to the east and south for a further 8km before heading south west for a further 30 km on the N52, passing through the villages of Blue Ball and Kilcormac, in the direction of the town of Birr. The route then turns right onto the N62, using a temporary bypass of the existing junction (known as Kennedy’s Cross), just to the north of Birr, heading due north for approximately 8km to the parts of the proposed site. The proposed access junctions are located approximately 200m north of the access to the existing Bord na Móna Briquette Factory.

Three entrances are proposed for the construction stage of the proposed development in order to transport turbine components, materials and equipment to the site. All are existing Bord na Móna machinery entrances which have been in use by the machinery involved in peat harvesting activities. Entrances proposed are as follows:

- Existing entrance off the N62 to Drinagh Bog;
- Existing entrance off the N62 to Clongawny Bog; and
- Existing entrance off the R357 which connects Drinagh and Noggus Bog.

The main entrances for the construction phase of the proposed development are located along the N62. These two entrances will provide access east and west into Drinagh and Clongawny bogs, respectively and will be designed to facilitate both materials delivery to the site (stone, steel and concrete) as well as large oversize components such as turbine blades and tower sections. Upgrade works will be required

to these entrance locations in order to accommodate access and egress of turbine delivery and construction vehicles. Following the construction phase of the proposed development, the upgraded areas of these entrances will be closed by erecting fencing, however they may need to be reopened during the lifetime of the development should replacement blades or other abnormal loads be required to access the site.

The access off the R357 will be used for delivery of substation components and materials required for the construction of the substation and grid connection works only and will not be used to provide access for turbine components. As such, this site entrance will have a comparatively low level of construction traffic and associated material deliveries. Minor upgrade works will be required to this entrance location in order to accommodate access and egress of construction vehicles. This entrance will be upgraded after construction to provide permanent access to a proposed amenity car park. In addition, the existing machine pass off the L7009 Local Road will be upgraded to provide permanent access to the proposed substation and local access to the proposed amenity pathway during the operational phase.

The delivery route for general HGV construction traffic may vary depending on the location of quarries and the suppliers used for stone and other materials required to construct the proposed development. Based on the location of quarries in the vicinity of the Proposed Development and the fact that deliveries of stone comprise the majority of deliveries to from the site.

It is estimated that a maximum of 100-120 staff members will be employed on the site at any one time during the site preparation and groundworks stage of construction, reducing to a maximum of 80 staff at any one time during the turbine construction stage. If a worst case is assumed that all staff will travel to /from the site by car, at an average of 2 persons per car, then a total of 120 pcu movements (each trip is two way) will be added to the network during the groundworks stage of the development, reducing to 80 pcu trips during the turbine construction stage.

It is estimated that the wind farm will be unmanned once operational and will be remotely monitored. Traffic associated with the operational phase of the wind farm will be from the wind farm operator, Eirgrid personnel visiting the substation, and maintenance personnel who will visit individual turbines. It is estimated that the traffic volumes that will be generated by the development once it is operational will be minimal, with a likely approx. 2 staff employed on site at any one time.

The successful completion of this project will require significant coordination and planning, and a comprehensive set of traffic management measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional temporary traffic generated by the proposed wind farm. The range of measures are set out in the Construction and Environmental Management Plan (CEMP) which will be implemented during construction and these measures include the appointment of a traffic management coordinator, agreement of a delivery programme with Offaly County Council, use of temporary signage, management of site access and provision of information to local residents.

Telecommunications and Aviation

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path.

Although it was noted that there was not potential for interference from RTÉ Transmission Network (operating as 2rn), it is standard practice of 2rn to produce a Protocol Document for wind farm developments, which will be signed by the developer. The Protocol Document ensures that in the event of any interference occurring to RTÉ television or radio reception due to operation of a wind farm, the

required measures as set out in the document, will be carried out by the developer to rectify this. The Protocol Document ensures that the appropriate mitigation is carried out in the event of any unanticipated broadcast interference arising to RTE television or radio reception as a result of the proposed wind farm.

No scoping response was received from Ripple.com, Airspeed, Comreg, Department of Defence - Telecoms, and EMR Solutions.

Of the scoping responses received from telephone, broadband and other telecommunications operators, Eir (Meteor), ESB Telecoms, Tetra Ireland Communications, Three Ireland, and Vodafone Ireland requested buffers to be added to existing links within the area. The requested buffers have been incorporated into the final proposed turbine layout and therefore, the proposed development does not overlap with any of the telecoms links or clearance zones as requested by operators.

In July 2018, a scoping response was received from the Department of Defence which set out lighting requirements for turbines, as follows:

- 1. Single turbines or turbines delineating corners of a wind farm should be illuminated by high intensity obstacle strobe lights.*
- 2. Obstruction lighting elsewhere in a wind farm will be of a pattern that will allow the hazard be identified and avoided by aircraft in flight.*
- 3. Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (NM) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light. Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment.*

The final design layout was sent to the Department of Defence on the 8th November 2019 and a response restating item 3, as above, was returned on 7th December 2019. In response to the lighting requirements requested by the Department of Defence, the turbines will be included on mapping, fitted obstruction lighting and entered into aircraft navigation databases to ensure they will be avoided during flight.

The Irish Aviation Authority (IAA) replied on the 25th June 2018 to a scoping request from MKO outlining recommended conditions should the project be granted a consent:

- 1. Agree an aeronautical obstacle warning light scheme for the wind farm development*
- 2. Provide as-constructed co-ordinates in WGS84 format together with ground and tip height elevations at each wind turbine location*
- 3. Notify the Authority of intention to commence crane operations with a minimum of 30 days prior notification of their erection.*

All of the above requests will be complied with should the proposed development receive a grant of planning permission.

In summary, there will be no significant impact on telecommunications and aviation as a result of the proposed development.

Interactions of the Foregoing

Chapters 5 to 14 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity, Ornithology, Land, Soils and Geology, Hydrology and Hydrogeology, Air and Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage and Material Assets, as a result of the proposed development. All of the potential significant

effects of the proposed development and the measures proposed to mitigate them have been outlined in the main EIAR. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect.

A matrix is presented in Chapter 15 of the EIAR to identify interactions between the various aspects of the environment already discussed in the EIAR. The matrix highlights the occurrence of potential positive or negative impacts during both the construction and operational phases of the proposed development. Where any potential interactive impacts have been identified, appropriate mitigation is included in the relevant sections (Chapters 5–14) of the EIAR.