

NON-TECHNICAL SUMMARY

Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by MKO on behalf of Coole Wind Farm Ltd., which intends to apply to An Bord Pleanála for planning permission, in accordance with Section 37E of the Planning and Development Act 2000 (as amended), to construct a wind energy development and all associated infrastructure near Coole, in north Co. Westmeath.

The application meets the threshold for wind energy set out in the Seventh Schedule of the Planning and Development (Strategic Infrastructure) Act 2006, as confirmed by An Bord Pleanála, and is therefore being submitted directly to An Bord Pleanála ('the Board') as a Strategic Infrastructure Development (SID), in accordance with Section 37E of the Planning and Development Acts 2000 to 2019.

The EIAR will accompany the planning application for the Proposed Development to be submitted to the Board. The planning application will also be accompanied by a Natura Impact Statement (NIS).

The proposed wind farm site is located approximately 2.4 kilometres north of Coole village (i.e. distance from Coole village centre to the main wind farm site boundary). The town of Castlepollard is located approximately 6.7 kilometres southeast of the wind farm site boundary, at its nearest point. The site is accessed via the R396 Regional Road, which travels in a southeast-northwest direction between Coole and Granard. From the R396, the L5755 local road traverses the site, linking to the R394 Regional Road, east of the Proposed Development site.

Land-use on the subject site is associated with commercial peat harvesting, commercial forestry and pastoral agriculture. Land-use in the wider landscape comprises a mix of large-scale peat extraction, pastoral agriculture, low density residential and commercial forestry.

A previous application for a wind farm development at this location was submitted by Coole Wind Farm Ltd. to Westmeath County Council on the 19th October 2017 and was considered under Pl. Ref. 17/6292. This application comprised of a wind farm consisting of up to 13 No. wind turbines with a tip-height of up to 175 metres, upgrade of existing internal access roads and provision of new internal access roads, an on-site substation, underground cabling, temporary construction compound and all ancillary infrastructure. An Bord Pleanála issued the decision to grant permission for the wind farm on 27th March 2019. In preparing this EIAR for the Proposed Development, the applicant and design team have considered in full the previous applications for the project, along with Further Information Requests.

The Proposed Development is being brought forward in response to local, national, regional and European policy regarding Ireland's transition to a low carbon economy and associated climate change policy objectives. The Westmeath Wind Energy Strategy as outlined in the Westmeath County Development Plan 2014-2020, has designated the capacity of areas for wind energy development as either 'No Capacity' or 'Low Capacity'. The site of the Proposed Development is located within an area designated in the Westmeath County Development Plan, 2014-2020 as '**Low Capacity**' for wind energy development.

The townlands in which the proposed site and ancillary works are located are listed in Table 1 below.

Table 1 Townlands within which the Proposed Development is located

Development Works	Townland
Wind Farm, including Turbines and Access Roads, Substation, Construction Compound	Camagh, Carlanstown, Coole, Clonrobert, Clonsura, Doon, Monkstown, Mullagh, and Newcastle.
Proposed Borrow Pit	Mullagh
Junction Accommodation Works	Boherquill, Coole, Corralanna, Culvin,Joanstown and Mayne
Grid Connection Route	Camagh, Monkstown, Coole, Fearmore (Fore by), Newtown (Fore by), Mayne, Simonstown (fore by), Ballinealoe, Shrubbywood, Clonava, Lackan (Corkaree by), Soho, Ballynaclonagh, Abbeyland, Rathganny, Ballindurrow, Cullendarragh, Culleenabohoge, Ballynafid, Knightswood, Portnashangan, Culleen More, Farranistick, and Irishtown (Moyashel by)

Applicant

The applicant for the proposed project is Coole Wind Farm Ltd., which is owned by Statkraft Ireland Ltd. Statkraft Ireland is part of the wider Statkraft group, a global renewable energy company that develops, acquires, builds and operates utility-scale wind and solar power projects. The team at Statkraft Ireland has constructed a portfolio of approx. 299 Megawatts (MW) of wind projects in Ireland, operates approx. 417MW and has an established track record in wind energy in Ireland, with its Irish team based in Tullamore, Co. Offaly and the Cork Airport Business Park, Co. Cork. This team has previously developed wind farms in Counties Clare, Cork, Kerry, Donegal, Limerick, Galway, Waterford, Tipperary, Offaly and Tyrone.

Brief Description of the Proposed Development

The Proposed Development will comprise the construction and operation of up to 15 No. wind turbines and all associated works. The proposed turbines will have a tip height of up to 175 metres. The full description of the Proposed Development, as per the public planning notices, is as follows:

- i. Up to 15 No. wind turbines with a tip height of up to 175 metres and all associated foundations and hardstanding areas;*
- ii. 1 no. onsite electrical substation including a control building, associated electrical plant and equipment, welfare facilities and a wastewater holding tank;*
- iii. 1 no. temporary construction compound;*
- iv. Provision of new site access roads, upgrading of existing access roads and hardstand areas;*
- v. Excavation of 1 no. borrow pit;*
- vi. All associated underground electrical and communications cabling connecting the turbines to the proposed onsite substation;*
- vii. Laying of approximately 26 km of underground electricity cabling to facilitate the connection to the national grid from the proposed onsite substation located in the townland of Camagh to the existing 110kV Mullingar substation located in the townland of Irishtown;*
- viii. Upgrade works to the existing 110kV Mullingar substation consisting of the construction of an additional dedicated bay to facilitate connection of the cable;*

- ix. Construction of a link road between the R395 and R396 Regional Roads in the townland of Coole to facilitate turbine delivery;*
- x. Junction improvement works to facilitate turbine delivery, at the N4 junction with the L1927 in the townland of Joanstown, on land to the South East of railway line level crossing on the L1927 in the townland of Culvin, the L1927 and L5828 junction in the townland of Boherquill and the L5828 and R395 junction in the townland of Corralanna;*
- xi. Site Drainage;*
- xii. Forestry Felling;*
- xiii. Signage, and;*
- xiv. All associated site development works.*

A detailed description of the Proposed Development is provided in Chapter 4 of this EIAR.

Need for the Proposed Development

In March 2019, the Government announced a renewable electricity target of 70% by 2030. Ireland faces significant challenges in its efforts to meet EU targets for renewable energy by 2030 and its commitment to transition to a low carbon economy by 2050. Further detail can be found in Section 2.1 of this EIAR.

The Proposed Development is likely to be operational before 2030 and would therefore contribute to the 2030 renewables target. The EPA reported in July 2020 that Ireland is set to fall far short of all its carbon emissions reduction targets for 2030, despite additional climate action measures including those set out in the National Renewable Energy Action Plan (NREA), the National Energy Efficiency Action Plan (NEEAP), the National Development Plan 2018-2027 and the 2019 Climate Action Plan.

As such, the proposed Coole Wind Farm is critical to helping Ireland address these challenges as well as addressing the country's over-dependence on imported fossil fuels.

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 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 (including Shadow Flicker)*
- 6. Biodiversity*
- 7. Ornithology (Birds)*
- 8. Land, Soils and Geology*
- 9. Water (Hydrology and Hydrogeology)*
- 10. Air and Climate*
- 11. Noise and Vibration*
- 12. Landscape and Visual*
- 13. Archaeological and Cultural Heritage*
- 14. Material Assets (including Traffic and Transport, Telecommunications and Aviation)*

15. *Interactions of Effects*
16. *Schedule of Mitigation*

Background to the Proposed Development

Chapter 2 of the ELAR presents information on renewable energy and climate change policy and targets, the strategic planning context for the Proposed Development, a description of the Proposed Development site and planning history, scoping and consultation undertaken, and the cumulative impact assessment process.

Energy and Climate Change

The Proposed Development comprises the provision of wind turbines which will generate renewable energy and provide it for use onto the national grid. The need to decarbonise and reduce greenhouse gas emissions has always been imperative, however, in recent years the urgency involved has become clearer to all stakeholders. The Climate Action Plan published by the Government in 2019 has clearly identified the need for and urgency of change. 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 and states that in 2017 there was 3.3GW in place, therefore Ireland needs to more than double its installed capacity of wind generation.

Furthermore, the Programme for Government released in June 2020 also highlights the need for a clean and reliable supply of energy. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050.

The SEAI's 'Energy in Ireland 2020' report provides the most up to date figures available in relation to energy production and consumption in Ireland. The 2020 report found that wind generation accounted for 31.3% (normalised) of all electricity generated, further, wind energy accounted for 85% of the renewable energy generated in 2019. 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.

Local Policy

Westmeath County Development Plan 2014-2020

The policies of Westmeath County Council in relation to wind energy include:

- **Policy P-WIN2:** To strictly direct large-scale energy production projects, in the form of Wind Farms, onto cutover cutaway peatlands in the county, subject to environmental, landscape, habitats and wildlife protection requirements being addressed. In the context of this policy, industrial scale/large-scale energy production projects are defined as follows: Projects that meet or exceed any of the following criteria:
 - *Height: over 100 m to blade tip, or*
 - *Scale: More than five turbines*
 - *Output: Having a total output of greater than 5 MW*

The Proposed Development is classed as an industrial-scale or large-scale wind energy project and is primarily located on cutover cutaway peatland which is in line with the requirements of the County Development Plan in relation to the preferred locations for wind farms.

On the 24th April 2017, Westmeath County Council adopted Variation no. 2 of the County Development Plan 2014-2020, and was formerly incorporated into the Plan on the 19th of May, 2017. The variation made an amendment to the wind energy strategy for the council by inserting planning policy P-WIN 6 into Section 10.6 of the County Development Plan.

- **Policy P-WIN6:** To require a setback distance from residential dwellings of ten times the height of Industrial Wind Turbines. In the context of this policy, Industrial /Large-scale energy production projects are defined as follows: Projects that meet or exceed any of the following criteria: - Height: over 100m blade to tip, or - Scale: More than 5 turbines, or - Output: Having a total output of greater than 5MW

The matter of separation distances was fully considered by An Bord Pleanála in their consideration of the wind farm development previously proposed at this location under the provisions of PL. 300686 (Pl. Ref. 17/6292). The inspector in their report concluded that the Proposed Development could be considered acceptable in principle in terms of policy context noting that the development would make a positive contribution to the implementation of Ireland's national strategy policy on renewable energy, have an acceptable impact on the landscape, not seriously injure the residential or visual amenities of the area, and would be in accordance with the proper planning and sustainable development of the area.

Wind Energy Development Guidelines

The relevant considerations under the 'Wind Energy Development Guidelines for Planning Authorities' (Department of the Environment, Heritage and Local Government (DOEHLG), 2006) have been taken into account during the preparation of this EIAR.

The 'Wind Energy Development Guidelines for Planning Authorities' (DoEHLG, 2006) are currently the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document 'Proposed Revisions to Wind Energy Development Guidelines 2006 - Targeted Review' (December 2013), the 'Review of the Wind Energy Development Guidelines 2006 - Preferred Draft Approach' (June 2017), and the Draft Wind Energy Development Guidelines (December 2019). A consultation process in relation to the 2019 document concluded on the 19th of February 2020.

At time of writing, the Draft Guidelines have not yet been adopted, and the relevant guidelines remain those published in 2006. Due to the timelines associated with the planning process for renewable energy projects, it is possible that a version of the draft guidelines may be finalised during the consideration period for the current Proposed Development, this has been taken into account in the design of the wind farm.

Planning History

The relevant planning history of the Proposed Development site, the planning applications in the vicinity of the site along with other wind energy applications within the wider area are provided under Section 2.5 within this EIAR.

Scoping and Consultation

A comprehensive scoping and consultation exercise was undertaken during the preparation of this EIAR. A scoping report, providing details of the application site and the Proposed Development, was

prepared by MKO and circulated in August 2020. MKO requested the comments from relevant personnel/bodies in their respective capacities as consultees with regards to the EIAR process.

Pre-application consultations were held with Westmeath County Council in which the Proposed Development was introduced, detailed discussions were held with regards to the Proposed Development. Pre-application consultations also took place with An Bord Pleanála as part of the Strategic Infrastructure Development process. The Board's letter dated the 9th December 2020 confirmed that the Proposed Development falls within the scope of paragraphs 37A(2)(a) and (b) of the Act. Accordingly, the Board have confirmed that the Proposed Development would be strategic infrastructure within the meaning of Section 37A of the Planning and Development Act, 2000 (as amended), and that any application for planning permission must therefore be made directly to the Board.

Engagement with the public, local residents and local public representatives took place in many forms during the project design and preparation of the EIAR. Section 2.6.4 and 2.6.5 summarises the community consultation and how it influenced the design of the proposed project.

Consideration of Reasonable Alternatives

This chapter of the EIAR includes 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. This chapter of the EIAR addresses alternatives under the following main headings:

- > Do Nothing' Alternative
- > Alternative Locations
- > Alternative Renewable Energy Technologies
- > Alternative Turbine Numbers and Model;
- > Alternative Designs;
- > Alternative Grid Connections
- > Alternative Transport Route and Site Access; and
- > Alternative Mitigation Measures.

The 'Do-Nothing' scenario has also been assessed, i.e. an outline of what is likely to happen to the environment should the Project not be implemented.

Alternative Locations

The key policy, planning and environmental considerations for the selection of a potential wind farm site included:

- > Site location relative to the Westmeath Wind Energy Strategy's classification of areas considered suitable for wind farm development from a planning policy perspective;
- > Access to the national electricity grid possible within a viable distance;
- > Located outside areas designated for protection of ecological species and habitats;
- > Sufficient area of unconstrained land that could potentially accommodate wind farm development and turbine spacing requirements;
- > Consistently high average annual wind speeds;
- > Low population density; and
- > Visual Amenity.

The site was identified for potential development following a detailed desktop screening appraisal, firstly at national level and subsequently at regional and county level of all available sites which met the above criteria as set out in national and local policy with regard to the proposed siting of wind energy

developments. Following the review, the current Proposed Development site was identified as a suitable location for the provision of a wind farm of the scale proposed. The site of the Proposed Development is predominantly located within existing commercial peatland which allows the site to take advantage of existing access roads (which will be upgraded) where possible. The remainder of the site is situated on forestry and pastoral agricultural lands. The site does not overlap with any environmental designations and is accessible in terms of connection to the national grid. The site is also located in an area with a relatively low population density with appropriate annual wind speeds.

Alternative Technologies

The Proposed Development will be located predominantly on cutover bog and the remainder of the site is situated on forestry and pastoral agriculture lands. Alternative sources of renewable energy considered for the site included solar energy.

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic arrays (panels). To achieve the same electricity output, as is expected from the Proposed Development (up to 90 MW) from solar energy would require a significantly larger development footprint. In addition, a solar development would have a higher potential environmental effect on Hydrology & Hydrogeology, Traffic & Transport (construction phase) and Biodiversity (habitat loss) at the site. The proposal for a wind energy development at this site was considered to be the most efficient method of electricity production with the lesser potential for significant environmental effects.

Alternative Turbine Numbers and Model

The proposed wind turbines will typically each have a potential power output of approximately 5 - 6 megawatt (MW). It is proposed to install 15 turbines at the site which could achieve in the region of 90MW total output (the precise power output of the wind farm will be determined once the turbine model is selected which will be subject to a competitive tender process). Theoretically, such a wind farm could also be achieved on the proposed site by using smaller turbines (for example 3 MW turbine models). However, this would necessitate the installation of 30 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient or economically viable use of the wind resource available having regard to the nature of the site.

The 15-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 economical level.

Alternative Designs

The design of the Proposed Development has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. The aim being to reduce potential for environmental effects while designing a project capable of being constructed and viable.

Throughout the preparation of the EIAR, the layout of the Proposed Development has been revised and refined to take account of the findings of all site investigations, which have brought the design from its first initial layout to the current proposed layout that is the subject of this application for planning permission. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory consultees, the local community and local authorities, as detailed in Section 2.6 of Chapter 2.

The development of the final Proposed Development layout has resulted following feedback from the various studies and assessments carried out as well as ongoing negotiations and discussions with landowners and the local community. As information regarding the site was compiled and assessed, the number of turbines and the proposed wind farm layout were revised and amended to take account of these findings. The EIAR and wind farm design process was therefore an iterative process, where

findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts. Where changes were made to the proposed turbine layout during the design process, these updates were circulated to the project team on an ongoing basis and assessed to ensure they would not give rise to adverse environmental impacts.

As outlined in Section 1.1 in Chapter 1 of this EIAR, a 13 No. turbine wind farm at the Proposed Development site was granted by An Bord Pleanála in 2019. The previously permitted 13-turbine layout has been integrated into the site layout of the Proposed Development. Therefore, the previous iterations of the Proposed Development incorporates that of the previously permitted 13-turbine layout. The Proposed Development went through 4 separate iterations. A comparison of the potential environmental effects of the previous alternative layouts versus the final proposed layout is presented in Chapter 3.

The Proposed Development encompasses ancillary infrastructure required for the wind farm, including construction compounds, electricity substation and borrow pit. These features formed part of the project design from the outset, and were taken into consideration during the constraints mapping, site design and site assessment stages, as described Chapter 3.

Alternative Grid Connections

Two alternative cable route options were considered for the connection of the Proposed Development to the existing 110kV substation at Mullingar. Route Options A and B follow the same public roads from the proposed wind farm site to the village of Multyfarnham. From here, Option A follows the public roads east of Lough Owel, while Option B follows the public roads west of Lough Owel. Following a review of the options and ongoing consultation with EirGrid, it is proposed to connect the development to the 110 kV substation at Mullingar via underground cable using route option A. This route is approximately 4.2 kilometres shorter in length and had fewer water crossing points than route option B. This minimises the potential for additional environmental effects.

Alternative Transport Routes and Site Access

Wind turbine components (blades, nacelles and towers) are not manufactured in Ireland and therefore must be imported from overseas and transported over land to the Proposed Development site. With regard to the selection of a transport route to the Proposed Development site, alternatives were considered in relation to turbine components, general construction-related traffic, and site access locations. The main site entrance is located off the R396 Regional Road with access to the site for construction purposes from the L5755 which adjoins the R396 and R394. From the R395, the turbine delivery route will connect to the R396 via a new section of access road in the townland of Coole, thereby avoiding the left-hand-turn in Coole village. This route makes optimum use of the National road network.

Description of the Proposed Development

The layout of the Proposed Development has been designed to minimise the potential environmental effects of the wind farm, while at the same time maximising the energy yield of the wind resource passing through the site. A constraints study, as described in Section 3.6.1 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the site.

The overall layout of the Proposed Development is shown on Figure 4-1 in Chapter 4. This figure shows the Proposed Development infrastructure. Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to this EIAR.

Wind Turbines

The proposed wind farm will encompass up to 15 No. turbines with a maximum ground to blade tip height of up to 175 metres. Within this size envelope, various configurations of hub height, rotor diameter and ground to blade tip height may be used. For the purposes of this EIAR, various types and sizes of wind turbines with a tip height of up to 175-metres have been selected and considered in the relevant sections of the EIAR to assess the worst-case scenario. Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport and ecology (specifically birds), as addressed elsewhere in this EIAR. In each EIAR section that requires the consideration of turbine parameters as part of the impact assessment, the turbine design parameters that have been used in the impact assessment are specified.

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level.

Assuming a minimum installed capacity of 90 MW, the Proposed Development has the potential to produce approximately 275,940 MWh (megawatt hours) of electricity per year. This would be sufficient to supply 65,700 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity.

Site Roads

The Proposed Development makes use of the existing forestry road network insofar as possible. In total, it is proposed to construct approximately 11.14 kilometres of new access road (including the link road and borrow pit access road), and to upgrade approximately 3.13 kilometres of existing access track.

Borrow Pits

It is proposed to develop 1 No. borrow pit as part of the Proposed Development. It is proposed to obtain the majority of all rock and hardcore material that will be required during the construction of the Proposed Development from the on-site borrow pit. Usable rock may also be won from other infrastructure construction including the substation and the turbine base excavations. Following removal of the rock from the borrow pit, it is proposed to reinstate the borrow pit using excavated subsoils and topsoil that were stripped from the borrow pit to expose the bedrock.

Electricity Substation and Grid Connection

It is proposed to construct one on site electricity substation within the Proposed Development site. The proposed substation site is located within an area of forestry. The proposed substation compound will include the substation control building and electrical components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the wind farm to the national grid.

The Proposed Development will connect to the national electricity grid via Mullingar 110 kV substation. The proposed grid connection route measures approximately 26 km in length from the proposed wind farm site to the existing substation near Mullingar. The grid connection route would comprise underground cabling located primarily within the public road corridor, with a short section of underground cabling (approximately 700m) across private lands at the northernmost end.

It is proposed to carry out works at the existing Mullingar 110kV substation to accommodate the connection of the Proposed Development.

Site Cabling

Each turbine will be connected to the onsite electricity substation via an underground electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts approximately 1.2 metres below the ground surface, along the sides of roadways.

Temporary Construction Compounds

A temporary construction compound is proposed as part of the Proposed Development. The construction compounds will consist of temporary site offices, staff facilities and car-parking areas. Temporary port-a-loo toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being transported off site via tankers by an appropriately consented waste collector to wastewater treatment plants.

Tree Felling and Replanting

A total of 16.36 hectares of forestry is required to be felled within and around the Proposed Development footprint. The tree felling activities required as part of the Proposed Development will be the subject of a Felling Licence application to the Forest Service, as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the wind farm be submitted with the felling licence applications; therefore the felling licenses cannot be applied for until such time as planning permission is obtained for the Proposed Development.

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for turbine bases, access roads, and any other wind farm-related uses will have to be replaced by planting at an alternative site. The replacement of the felled forestry can occur anywhere in the State subject to licence. A potential replanting site has been identified in County Roscommon with an approved area for planting of 16.53 hectares. These lands have been granted Forest Service Technical Approval for afforestation, and these or similarly approved lands will be used for replanting should the proposed wind farm receive planning permission. A description of the proposed replanting lands and an assessment of the potential impacts including cumulative impacts associated with afforestation at this location are provided in Appendix 4-6 of this EIAR.

Site Activities

All proposed activities on the site of the Proposed Development will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Development and is included in Appendix 4-8 of this EIAR. The CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the Proposed Development. The CEMP also details the mitigation measures to be implemented in order to comply with the environmental commitments outlined in the EIAR. The contractor will be contractually obliged to comply with all such measures. The CEMP also includes a Waste Management Plan and Emergency Response Plan.

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

Turbine and Construction Materials Transport Route

It is proposed to deliver turbines to the site from the port of delivery (i.e. Dublin, Cork or Waterford) via the M4 motorway and then the N4 National Primary Road single-lane carriageway between Mullingar and Edgeworthstown. From the N4, the turbine delivery route turns northwards on the L1927 local road, then turns right onto the L5828 at Boherquill, and from here onto the R395 Regional Road at Corralanna. From the R395, the turbine delivery route will then connect to the R396 via a proposed new section of access road ("link road") in the townland of Coole, thereby avoiding the existing left-hand-turn in Coole village.

It is proposed to upgrade the existing forestry track entrance off the R396 Regional Road for use as the wind farm site entrance for the construction and operational phases. The delivery of all turbine and construction materials to the site will be via the site entrance off the R396. From here, the vehicles will use the internal site roads to access the proposed infrastructure locations within the site.

Improvements and modifications to existing public road infrastructure on the turbine delivery route to facilitate delivery of abnormal loads are required at eleven locations.

Community Benefit Fund

Should Coole Wind Farm be consented, it has the potential to provide significant additional investment into community projects that will benefit local residents and businesses. Details were announced on the 24th July 2018 of the new RESS with the detailed terms and conditions of this scheme being confirmed in February 2020. Renewable energy projects which are developed under this scheme will have a significantly increased community benefit fund associated with them and for wind energy, this contribution is currently set at €2/MWhr. Based on the current layout and design, should the Coole Wind Farm be developed under RESS, it would attract a community contribution in the region of approx. €500,000/year for the local community for the lifetime this support. The value of this fund would be directly proportional to the electricity generated by the wind farm.

Site Drainage

The drainage design for the Proposed Development has been prepared by Hydro Environmental Services Ltd. (HES). The drainage design has been prepared based on the extensive experience of the project team of afforested wind farm sites, and the number of best practice guidance documents referred to in the References section of the EIAR.

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed has been of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Development. The Proposed Development's drainage design has therefore been proposed specifically 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 via settlement ponds, and over vegetation filters at a significant distance from natural watercourses.

Drainage water from any works areas of the wind farm site will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting

any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

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

Construction Sequencing

It is estimated that the construction phase including civil, electrical, grid works and turbine assembly will take approximately 12 to 18 months. The construction phase can be broken down into three main phases, 1) civil engineering works, 2) electrical works and 3) turbine erection and commissioning.

Operation

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

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

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

Decommissioning

Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to fulfilment of planning requirements at that time, or the Proposed Development may be decommissioned fully. The onsite substation will remain in place as it will form a permanent part of the electricity grid.

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

Population and Human Health

One of the principal 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, operation and decommissioning 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 proposed wind farm site is located approximately 2.4 kilometres north of Coole village. The town of Castlepollard is located approximately 5.9 kilometres southeast of the site, at its nearest point. Access to the site is via regional and local roads. The site is accessed via the R396 Regional Road, which travels in a southeast-northwest direction between Coole and Granard. From the R396, the L5755 local road traverses the site, linking to the R394 Regional Road, east of the Proposed Development site. The main services for the Study Area are located within Coole which is classified as a village and Castlepollard, which is also classified as a village. The town of Mullingar is located approximately 1 kilometre south of the southern end of the Grid Connection Route at the existing Mullingar substation. The Grid Connection Route also passes through the villages of Coole and Multyfarnham.

There are no key identified tourist attractions pertaining specifically to the site of the Proposed Development itself.

Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the Westmeath County Development Plan 2014-2020, Fáilte Ireland. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2016, which is the most recent census for which a complete dataset is available, also the Census of Ireland 2011, the Census of Agriculture 2010 and from the CSO website (www.cso.ie). Census information is divided into State, Provincial, County, Major Town and District Electoral Division (DED) level.

The Study Area for the Population section of this EIAR is defined in terms of the District Electoral Divisions (DEDs) where the Wind Farm Site is located, and where relevant, nearby DEDs which may be affected by the Wind Farm Site. The Wind Farm Site lies within three DEDs: Knockarrow, Glore and Coole of Co. Westmeath and borders Boherquill and Firry/Newgrove of Co. Longford. The Population Study Area for the wind farm site has a population of 878 persons, as of 2016 and comprises a total land area of 83.29 km² (Source: CSO Census of the Population 2016).

In order to assess the population along the Grid Connection Route, a review of properties and planning applications in the vicinity of the Grid Connection Route was carried out.

There are 18 no. occupied dwellings located within one kilometre of the proposed turbine locations. The closest occupied dwelling H14 (i.e. dwelling not involved with the Proposed Development) is located at a distance of approx. 700 metres from the nearest proposed turbine T11. There are two dwellings, H18 & H24 which are located at distances of 638m and 679m from T15 respectively however these are individuals involved with the Proposed Development.

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 finding 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.

Impacts on human beings during the construction, operational and decommissioning 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, 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 health in the surrounding 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, operated and decommissioned 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 or local scale.

Economic Benefits

The Proposed Development will have several significant long-term and short-term benefits for the local economy including job creation, local authority commercial rate payments and a Community Benefit Scheme.

Commercial rate payments for the wind farm will contribute significant funds to Westmeath County Council, which will be redirected to the provision of public services within Co. Westmeath. These services include provisions such as road upkeep, fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives.

It is estimated that the proposed project will create up to 135 jobs during the construction, operation and maintenance phases of the Proposed Development. During construction, additional employment will be created in the region through the supply of services and materials to the development. In addition to this, there will also be income generated by local employment from the purchase of local services i.e. travel and lodgings.

Shadow Flicker

Shadow flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in a nearby property. Shadow flicker 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. The current *Wind Energy Development Guidelines for Planning Authorities* (DoEHLG, 2006) 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. There are no dwellings located within 500 metres of the proposed turbines, nevertheless the relevant thresholds have been used as part of this assessment.

Shadow flicker assessments are typically undertaken for properties located within ten rotor diameters of proposed turbine locations. At distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low (DoEHLG, 2006). As the maximum potential rotor diameter of the proposed Coole Wind Farm turbines measures 155 metres, a study area of 1,550 metres has been used in this assessment to determine the potential for shadow flicker by the Proposed Development on properties in the surrounding environs. There is a total of 63 properties located within the shadow flicker study area, of which 47 are dwellings, 8 are derelict, and 8 are commercial/agricultural buildings. There are no occupied dwellings within 500 metres of any proposed turbine location.

The potential flicker that will occur at houses located within the area surrounding the Proposed Development was calculated using the WindFarm computer software. The 8 commercial/agricultural buildings have been excluded in the property list for shadow flicker modelling. Of the 55 No. properties modelled, 33 No. properties may experience daily shadow flicker in excess of the DoEHLG guideline threshold of 30 minutes per day. Of the 55 No. properties modelled, when the regional sunshine average (i.e. the mean amount of sunshine hours throughout the year) of 30.1% and wind direction reduction factor (37%) is taken into account, the DoEHLG total annual guideline limit of 30 hours is predicted to be exceeded at 3 No. properties.

Where shadow flicker exceedances are experienced at buildings, 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 such as wind turbine control measures including turbine shutdown and/or screening will be employed to eliminate the exceedance to zero shadow flicker at the affected property. Coole Wind Farm Ltd. has committed to committed to zero shadow flicker at occupied residential receptors within 10 rotor diameter of proposed turbines.

Biodiversity

This chapter of the EIAR assesses the flora and fauna of the receiving environment for the Proposed Development. The ecology of the area surrounding the Proposed Development was first assessed in terms of habitats and species. The area over which the Proposed Development has the potential to result in effects (zone of influence) was then determined. Following this, the chapter identifies the Key Ecological Receptors (KERs) within the zone of influence and accurately assesses the potential for effects thereon.

This chapter quantifies any potential effects relating to flora/fauna and KERs and identifies the measures required to avoid, reduce and mitigate likely significant effects. Identification of effects and prescribed mitigation has been derived following a collaborative approach working with a multi-disciplinary team including project engineers, ecologists, hydrologists and hydrogeologists. The results of ecological surveys have been utilised to inform the design of the Proposed Development, thereby minimising potential effects on sensitive habitats and species of conservation interest.

The Coole Wind Farm Site study area is dominated by Cutover Bog (PB4). Much of Coole bog comprises milled peat and is divided up by drains, spaced approximately 15m apart, which separate long parallel peat production fields. The lands to the east of the site comprise agricultural land. The edge of the main wind farm site is bordered by Conifer Plantation (WD4) to the east and south while the lands surrounding T15 are predominantly agricultural in nature. The proposed turbine T15 is located to the east of the site within agricultural grassland categorized as Improved Agricultural Grassland (GA1)/Wet Grassland (GS4). The proposed turbine T5 and turbine T14 are located within Conifer Plantation (WD4). The remaining turbines locations are situated in Cutover Bog (PB4).

The proposed grid connection route will be located within the carriageway/verge of existing public roads. There is no requirement to use habitats located outside the road carriageway except at the Northern and Southern ends where the connection points leave the public road for termination. All roads within/adjacent to the proposed cable route were classified as Building and Artificial Surfaces (BL3). Much of the cable route was bordered by a verge supporting Dry Meadows and Grassy Verges (GS2). Also present along the road, outside the working area, were Hedgerows (WL1), Treelines (WL2), Earth Banks (BL2), Stone Walls (BL1), Scrub (WS1), Spoil and Bare Ground (ED2), Flower Beds and Borders (BC4) and Buildings and Artificial Surfaces (BL3). Habitats recorded beyond the road boundary included Improved Agricultural Grassland (GA1), Wet Grassland (GS4), Cutover Bog (PB4), Wet Heath (HH3) and Conifer Plantation (WD4). Less frequently recorded habitats included Mixed Woodland (WD2), Broadleaved Woodland (WD1), Amenity Grassland (GA2) and Reed and Large Sedge Swamps (FS1).

There are 3 no. watercourse crossings proposed within the Wind Farm Site. This will comprise clear span bridges with no requirement for instream works. There are 16 no. watercourses along the public road of the proposed grid connection. No instream works will be required as part of the proposed grid connection works. A suite of best practice measures have been incorporated into the design of the Proposed Development to ensure there are no indirect impacts on these watercourses.

Third Schedule invasive species, Rhododendron (*Rhododendron ponticum*), Japanese Knotweed (*Fallopia japonica*) and Bohemian Knotweed (*Fallopia bohemica*) were recorded at 5 locations along the grid connection route in the townlands of Clonava, Multyfarnham and Ballinealoe. All works in these areas will be confined to the existing road. Best practice measures are in place to ensure no Third Schedule invasive plants are spread as a result of the Proposed Development.

The assessment identifies a number of KERS: Degraded Raised Bog, Dystrophic Lake, River Gloré Corridor and River Inny, Bog Woodland, Otter, Badger and Bat species. Habitats listed in Annex I of the EU habitats Directive were not recorded within the Proposed Development footprint or along the turbine delivery or grid connection routes. No Annex I habitats will be impacted as a result of the Proposed Development. Levels of faunal activity were extremely low and evidence recorded was associated with the periphery of the site.

Ecological evaluation of the KERS follows a methodology that is set out in Chapter three of the *'Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009). The KERS identified within the footprint of the Proposed Development were found to be of importance at the Local Level only. No KERS of County, National or international importance will be impacted by the proposed works.

The proposed grid connection traverses the Royal Canal pNHA to the southern section of the route. Works will be restricted to the existing road at this location and will not directly impact the Royal Canal pNHA. Although the proposed grid connection occurs adjacent to the boundary of a number of designated sites, works will be carried out within the existing road corridor at these locations. As a result, there will be no direct effects on any nationally designated site as a result of the construction, operation and decommissioning of the Proposed Development. Following the implementation of mitigation, there is no potential for significant effects on these Nationally Designated Sites.

Following consideration of the residual effects (post-mitigation) it can be concluded that the Proposed Development will not result in any significant effects on any of the identified KERS.

The following SACs are identified in the AA Screening as being within the Likely Zone of Impact and are assessed fully in the NIS that accompanies this application namely: Lough Owel SAC (000688), Lough Ennell SAC (000685), Lough Owel SPA (004047), Lough Ennell SPA (004044), Lough Derravaragh SPA (004043), Lough Iron SPA (004046). Effects upon European Sites are discussed within the Natura Impact Statement which accompanies this report. The NIS concluded that following examination, evaluation and analysis, in light of best scientific knowledge and the conservation objectives of the site, and, on the basis of objective information, having taken into account the relevant mitigation measures, it can be concluded that the Proposed Development will not have an adverse impact on any European Sites, either alone or in combination with other plans or projects.

Provided that the Proposed Development is constructed and operated in accordance with the design, best practice and mitigation that is described within this application, significant individual or cumulative effects on biodiversity are not anticipated at the international, national or county scales.

Ornithology (Birds)

This 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 methodologies that were 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 Environmental Impact Assessment Report (EIAR) appendices with a summary of the information presented within this chapter. An analysis of the results is then provided, which discusses the ecological significance of the birds recorded within the study area. The potential effects of the Proposed Development are then described in terms of the construction, operation and decommissioning phases of the Proposed 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 identification of Key Ornithological Receptors and the assessment of effects follow a precautionary approach.

The potential for effects on designated sites is fully described in the Natura Impact Statement that accompanies this application. The findings presented in the NIS are that the Proposed Development, by itself or in combination with other plans and projects, in light of best scientific knowledge in the field, will not adversely affect the integrity of the relevant European sites and no reasonable scientific doubt remains as to the absence of such effects.

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, disturbance displacement, collision risk and cumulative effects have been assessed to be no greater than Long-term moderate negative effect (EPA, 2017) and low effect significance (Percival, 2003).

The implementation of the prescribed mitigation measures will further reduce the significance of any potential effects on avian receptors. In conclusion, no significant effects as a result of the Proposed Development are foreseen on key ornithological receptors of the study area.

Land, Soils and Geology

Wind Farm Site

The geology of the Wind Farm Site has been characterised using desk study and site investigation data. Peat depths from >250 peat probes range from 0 to 7.8m, and peat is underlain by shell marl and lacustrine clay deposits at the Wind Farm Site. Peat depths recorded during the drilling of the 13 no. rotary core boreholes at proposed turbine locations ranged from 2-12.5m. The upper value of 12.5m recorded at T12 appears to be a local anomaly as other peat depth data from within ~50/100m of T12 indicates peat depths of ~4.5-5.3m. Average peat depths (number of data points = 10) recorded at the substation location is 2.0m. It is stated within the geotechnical risk register (Appendix B of Appendix 8-1) that all infrastructure locations will be formed on piled areas with the exception of T5 and T15. The majority of new access tracks within the Wind Farm Site will be constructed using a floated technique, with some minor areas formed using excavate and replace method.

Excavation of peat, mineral subsoils and bedrock (from the borrow pit) will be required for site levelling and for the installation of the grid connection cable, infrastructure and foundations for the access roads and turbine T5 and T15. The handling and storage of peat will be done in accordance with the Peat Management Plan. Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Measures to prevent peat and subsoil erosion during excavation, reinstatement and long term storage of peat will be undertaken to prevent erosion and potential water quality impacts.

A peat stability assessment undertaken for the site show that the risk of peat failure is designated trivial and that the site has an acceptable margin of safety. A similar peat stability assessment has been completed for the Grid Connection Route for areas where peat deposits occur. This stability analysis shows that the inclusion of the cable trench would not reduce the stability of the existing road embankments along the Grid Connection Route.

An assessment of the wind farm construction stage, operational stage and decommissioning stage has been completed, along with a cumulative assessment for each stage. Based on the above, and with implementation of the outlined mitigation measures, no significant impacts on the soils and geology environment are predicted to occur.

Grid Connection Route

Excavation of peat, subsoil and bedrock will be required for the formation of trenches to accommodate the high voltage power line along the Grid Connection Route. This will result in a permanent removal of some peat and subsoil at most excavation locations, however it is likely that the majority of the peat

and subsoil will be reinstated within the trench. Excavated peat will be utilized where possible to re-instate any excavations. The handling and management of peat will be undertaken in accordance with the Construction and Environmental Management Plan (Appendix 4-8). Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Measures to prevent peat and subsoil erosion during excavation, reinstatement will be undertaken to prevent water quality impacts.

A geophysical survey and peat probing works were carried out along the Grid Connection Route. Overall, peat depths recorded during the peat probing investigation ranged from 0 to 6.3m with an average of 1.8m. Approximately 75% of the peat probes recorded peat depths of less than 1.25m with 95% recording depths less than 4.25m.

A peat stability assessment undertaken along the Grid Connection Route shows that the risk of peat failure is designated trivial and tolerable and that the site has an acceptable margin of safety.

An assessment of the grid connection construction stage, operational stage and decommissioning stage has been completed, along with a cumulative assessment for each stage. Based on the above, and with implementation of the outlined mitigation measures, no significant impacts on the soils and geology environment are predicted to occur.

Hydrology & Hydrogeology

Wind Farm

On a regional scale, the Wind Farm Site is located in the Inny River surface water sub-catchment, which is in the Upper Shannon catchment within Hydrometric Area 26 of the Shannon International River Basin District (SIRBD). On a local scale the wind farm site drains directly to the Inny River, or via its tributary the Glore River. The Inny River flows south from the Wind Farm Site into Lough Derravaragh approximately 7.5km downstream of the site.

Three peat basins occur across the wind farm site. Within the wind farm site, there are numerous manmade drains that are in place predominately to drain the bog for peat cutting. The integration of the proposed wind farm infrastructure with the existing bog drainage in a manner that avoids water quality impacts in downstream rivers and streams is a key component of the wind farm design. The water quality of the local rivers is typically moderate to good, with Q values measured along the Inny and Glore at 5 no. locations. The site drains to the local rivers via 5 no. surface water outfalls from the bog.

Due to the nature of wind farm developments, being near surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risk to groundwater at the site would be from oil spillage and leakages at the borrow pit or during construction plant refuelling. These are common potential impacts to all construction sites (such as road works and industrial sites). These potential contamination sources are to be carefully managed at the site during the construction and operational phases of the development and measures are proposed within the EIAR to deal with these potential minor local impacts.

The Lough Bane pNHA is a small lake located on the northeastern boundary of the Wind Farm Site and is hydraulically upgradient of the Wind Farm Site. Lough Derravaragh, which is designated as an NHA is located downstream of the Inny River. Following implementation of the appropriate mitigation measures as outlined in the EIAR there will be no impact on these designated from a hydrological perspective.

Two methods will be employed to control drainage water within the site during construction, thereby protecting downstream surface water quality and aquatic habitats. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or

around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt, to allow settlement and cleaning prior to its release. During the construction phase all runoff will be treated to a high quality prior to being released. There will be no risk of increased flooding down-gradient of the site as a result of the Proposed Development due to these drainage measures. Impacts on water quality during the construction phase of the wind farm will be imperceptible to none. A surface water monitoring programme will be put in place during the construction phase.

During each phase of the Proposed Development (construction, operation and decommissioning) a number of construction related activities will take place on the Wind Farm Site which will have the potential to affect the hydrological regime or water quality at the site or its vicinity. These potential effects 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. These potential effects are similar to any construction site.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant adverse effects on water quality and downstream designated sites.

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 drainage plan involves collecting any drainage waters from works areas within the site that might carry silt or sediment, and nutrients, to route them towards new proposed silt traps and settlement ponds (or stilling ponds) prior to controlled diffuse release into the existing field drainage network. There will be no direct discharges to any existing natural watercourse from the wind farm construction, operation or decommissioning works.

The proposed wind farm drainage measures will in effect create significant additional attenuation to what is already present at the site. The net effect of this will be a reduction in the overall runoff from the bog. The Proposed Development will in effect retain water within the bog for longer periods and therefore there will be no risk of downstream flooding.

An assessment of the wind farm construction stage, operational stage and decommissioning stage has been completed, along with a cumulative assessment for each stage. Based on the above, and with implementation of the outlined mitigation measures, no significant impacts on the surface water and groundwater environments are predicted to occur.

Grid Connection

The Grid Connection Route is located within the Shannon International River Basin District. With respect to regional hydrology, the Grid Connection Route is located in 2 no. regional surface water catchments (the River Inny and the River Brosna). The area north of Lough Owel all occurs within the River Inny catchment. The southern section of the Grid Connection Route, along the eastern edge of Lough Owel and on to Mullingar (~8km long) is located within the River Brosna catchment.

Drainage along the Grid Connection Route is limited to existing roadside drains along the N4 and L1826 roads. In areas where these drains are not present, runoff from the road hardstanding will generally flow towards the grass verge along the majority of the route and infiltrate to ground.

Surface water quality at watercourses along the Grid Connection Route is generally good, with Q values measured at 7 no. locations. The Q ratings range between Q3-Q5 along the River Gaine and River Inny and Q3-Q4 along the River Brosna. Surface water monitoring has been completed by HES at 20 no. locations along the grid route, which mirrors the generally good status of these surface waters.

Designated sites located near the Grid Connection Route include the Gariskil Bog SAC, Lough Owel SAC, Scragh Bog SAC, Lough Derravaragh NHA and Ballynafid Lake and Fen NHA. The closest

designated site to the Grid Connection Route is the Garsikil Bog SAC (60m at closest point), which is located hydraulically upgradient of the proposed Grid Connection Route. Based on the distances involved, the hydraulic gradients, the roadside verge which acts as a buffer zone and the proposed mitigation measures outlined in Chapter 9 of the EIAR, there will be no significant impacts on designated sites in terms of the hydrological and hydrogeological environment.

An assessment of the grid connection construction stage, operational stage and decommissioning stage has been completed, along with a cumulative assessment for each stage. Based on the above, and with implementation of the outlined mitigation measures, no significant impacts on the surface water and groundwater environments are predicted to occur.

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 Clean Air for Europe (CAFE) Directive (as amended) and the Fourth Daughter Directive. The site of the Proposed Development lies within Zone D, which represents rural areas located away from large population centres.

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 Proposed Development include vehicular and dust emissions.

A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-8 of the EIAR) and includes dust suppression measures. In addition, turbines and construction materials will be transported to the site on the 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 linked to increased 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.

The Environmental Protection Agency (EPA) publishes Ireland's Greenhouse Gas Emission Projections with the most recent report, *Ireland's Greenhouse Gas Emissions Projections 2019–2040* published in July 2020. The report includes an assessment of Ireland's progress towards achieving its emission

reduction targets out to 2030 will result in a reduction in Ireland's total greenhouse gas emissions by up to 23% only with the full and early implementation of the 2019 Climate Action Plan.

The EPA Emission Projections notes the following key trends:

- *Total emissions are projected to decrease from the latest 2018 levels by 2% and 6% by 2030 under the "With Existing Measures" scenario.*
- *Under the "With Additional Measures" scenario, emissions are estimated to decrease by 23% by 2030.*
- *Ireland's non-Emissions Trading Scheme (ETS) emissions are projected to be 5% and 6% below 2005 levels in 2020 under the 'With Existing Measures' and 'With Additional Measures' scenarios, respectively. The target for Ireland is a 20% reduction.*
- *Ireland exceeded its annual binding limits in 2016, 2017 and 2018.*
- *Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 13.4 Mt CO₂ (metric tonnes of Carbon Dioxide) equivalent under the 'With Existing Measures' scenario and 12.6 Mt CO₂ equivalent under the 'With Additional Measures' scenario. Reporting on Ireland's compliance obligations status for this period have not yet been published. .*

This chapter of the EIAR calculates the carbon savings associated with the Proposed Development. In total, it is estimated that **22,688,629** tonnes of carbon dioxide will be displaced over the proposed thirty-year lifetime of the Proposed Development.

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 Coole Wind Farm development.

The methodology adopted for assessing the noise impact of the wind energy development is based on the guidance in the document '*Wind Energy Development Guidelines for Planning Authorities*' published by the Department of Environment, Community and Local Government, which are based on the UK document ETSU-R-97 The Assessment and Rating of Noise from Wind Farms which describes a detailed method for deriving maximum values of wind turbine noise, when measured at an external location in the vicinity of a house. Maximum values, or limits, are primarily based on the background noise levels and how it varies with wind speed, in the absence of wind farm.

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 wind noise in foliage, local road traffic noise and other agricultural and anthropogenic sources in the area.

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 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 limit values. The associated 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 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 limits recommended in Irish guidance, therefore 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.

In summary, the noise and vibration impact of the Proposed Development is not significant in the context of current national guidance.

Landscape and Visual

The Landscape and Visual chapter of the EIAR addresses the potential landscape and visual impacts of the proposed Coole 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.

The Proposed Development is located on an area of cutover peatland, coniferous forestry and agricultural land. The Westmeath County Development Plan 2014-2020 identifies cutover peatlands as the preferred location for large scale wind energy production. The landscape surrounding the site is relatively flat and landcover primarily comprises cutover peatlands, agricultural land, coniferous forestry, scattered settlements, hedgerows and clusters of deciduous woodland.

Visibility of the Proposed Development was assessed from all geographic perspectives within 20 km of the proposed turbines using tools such as ZTV mapping, photomontages, a route screening analysis and also on-site appraisal during site visits. The ZTV mapping was used as a tool to identify visual and landscape receptors within 20 km of the proposed turbines that had no theoretical visibility of the Coole Wind Farm, these receptors were then screened out from further assessment. A comparative ZTV map demonstrated the additional theoretical visibility of the Proposed Development (15 Turbine Layout) in comparison to the permitted Coole Wind Farm (13 Turbine Layout). This comparative ZTV map indicated that only a very small proportion (0.09%) of the study area (20km radius) would have additional theoretical visibility of the Proposed Development.

Surveys conducted during site visits and a route screening analysis exercise highlighted an abundance of screening factors (e.g. vegetation, localised topography undulations) existent within the landscape surrounding the site. These exercises determined that localised screening elements are amplified in the flat terrain, substantially obscuring visibility of the proposed turbines in vast areas where ZTV mapping indicates that there is full theoretical visibility. This disproportionate screening effect occurs in most areas of the Inny river basin where the combination of flat topography and the highly vegetated landscape substantially reduces visibility of the proposed turbines.

The proposed 15 turbine windfarm has a relatively small footprint, and the landscape effects of the Proposed Development on the fabric of the landscape are generally localised and will be more pronounced during the construction phase, removal of 16.36 hectares of forestry and removal of vegetation as well as the excavation of the borrow pit. It is considered that overall, the landscape effects

of the Proposed Development on the site itself as well as on the wider landscape will range from Long Term, Slight to Moderate effect.

A comprehensive assessment was conducted to determine the likely significant effects of the proposed turbines upon the landscape character of all designated Landscape Character Areas (LCAs) within 15 km of the site. The footprint of turbines and associated infrastructure of the Coole Wind Farm will only materially alter a very small portion (approximately 26 hectares - 0.13%) of the LCA in which it is situated - *Westmeath LCA 2 - Inny River Lowlands*. Therefore, any direct effects on landscape character are highly localised to the immediate landscape in which the turbines are located. 'Slight' effects on landscape character were recorded for four other LCAs, although these effects were indirect and are only likely to arise in small localised areas of these LCAs in close proximity to the site where open views can be found.

Twenty-two photomontages were used to represent the views from differing geographical perspectives and thematic visual receptors located within the LVIA study area. The likely significant visual effects arising at each photomontage viewpoint was determined by considering the magnitude of change attributed to the addition of the Coole Wind Farm balanced with the sensitivity of receptors located at each viewpoint. A residual visual effect was recorded for each viewpoint location in mind of mitigating factors, such as reduced visibility of turbines from screening factors.

No adverse or significant visual effects were recorded from any of the photomontage viewpoints. Assessment of likely visual effects determined a significance rating of 'Imperceptible' for one viewpoint, 'Not Significant' for six viewpoints, 'Slight' for eleven viewpoints, and 'Moderate' for four viewpoints. Viewpoints 3, 5, 7 and 21 were considered to have visual impact of Moderate significance. In these views all 15 turbines are visible in relatively close proximity to the viewpoint and turbines comprise a moderate spatial extent in the view. The existing Ballyjamesduff turbine was not visible in any of the photomontages, therefore, no significant cumulative visual effects were recorded for any of the photomontages. The overall visual impact of the proposed turbines will vary depending on the location. The visual impacts represented by the photomontages 1-22 range from Imperceptible to Moderate significance and no visual impacts were deemed to be Significant.

In conclusion, the Proposed Development is an appropriately designed and suitably scaled project, and likely landscape and visual effects are deemed to be acceptable.

Archaeology and Cultural Heritage

The potential impacts of the Proposed Development on the surrounding archaeological, architectural and cultural heritage landscape were assessed. The assessment was based on desktop research, field surveys, GIS based mapping including Viewshed analysis and ZTV. Through a detailed examination of the baseline data available and a detailed site inspection, it was concluded that while the archaeological potential of the area is high no new sites were noted within the peatland areas of the Proposed Development, nor are any recorded archaeological or architectural assets located therein. One new potential archaeological monument was detected within the Wind Farm Site boundary at Clonrobert townland. It comprises an enclosed rectangular area in pasture c. 74m east of the proposed access road to T15. No direct impacts to this potential monument as a result of the Proposed Development have been identified. Furthermore, direct impacts to recorded archaeological and architectural assets as a result of the proposed turbines, substation, associated infrastructure and borrow pit have not been identified.

Where potential impacts are possible appropriate mitigation measures have been recommended in order to minimise any such impacts. Recommended mitigation includes re-assessment surveys due to the potential changing levels within the bog should further peat harvesting occur, pre-development archaeological testing where turbine bases, roads, etc will be excavated, and archaeological monitoring during the construction stage of the project. Indirect (visual) effects on the setting of National Monuments within 15km, RMPs within 5km and RPS/NIAH within 5km of the Proposed Development

were also assessed. No significant visual effects on the recorded archaeological, architectural or cultural heritage resource were identified.

The proposed Grid Connection Route was subject to assessment. All cultural heritage assets within 100m of the route were assessed for potential impacts to same. No direct impacts to the recorded or unrecorded archaeological, architectural or cultural heritage resource as a result of the proposed Grid Connection Route have been identified. Mitigation measures are recommended where deemed appropriate and include archaeological monitoring of ground works in specified areas along the proposed route. An assessment of potential impacts as a result of proposed Junction Accommodation Works along the proposed Turbine Delivery Route was also carried out. No direct or indirect impacts to the recorded archaeological or cultural heritage resource were identified.

An assessment of cumulative impacts as a result of the Proposed Development was also undertaken and no significant cumulative impacts have been identified when considered with other existing, proposed and permitted wind farm developments.

Material Assets

Traffic and Transport

An assessment of the traffic effects of a proposed Wind Farm development consisting of 15 turbines, located in north Co. Westmeath approximately 2.4 kilometres north of Coole village, was undertaken for both the construction and operational stages of the Proposed Development. The assessment considered the effects that traffic generated by the Proposed Development, including the abnormally large vehicles required to deliver the turbine plant equipment, would have on the surrounding highway network.

Traffic Route & Study Area

The optimum traffic route to the site approaching from the east is a right turn off the N4 approximately 800 metres east of Rathowen onto the local L1927 in the townland of Joanstown. The route heads north on the L1927 for approximately 8 kms, crossing a rail level crossing 2kms north of the N4 and then turns east in the townland of Boherquill, onto the L5828 local road for 2 kms, which links into the R395. From here, the delivery route heads east on the R395 for 2 kms before turning left onto a purpose-built access road which bypasses the village of Coole, exiting onto the R396 just north of the village. The route then heads north on the R396 for 2 kms before turning right off the R396 to access the site. The route then travels through the southern part of the Wind Farm Site before crossing the local road L5755 to access the northern part of the Wind Farm Site, and turning right onto the L5755 to access to turbines 14 and 15.

Vehicle types and network geometry

The types of vehicles that will be required to negotiate the local network will be up to 83.5 metres long (including the blade length of up to 77.5m), and a detailed assessment of the geometry of the proposed route was undertaken. Locations where it was established that existing road geometry will not accommodate all of the vehicles associated with the Proposed Development were identified, with the extent of additional land required to implement temporary remedial works established.

Traffic effects on local network

In terms of daily traffic flows the impact of the development traffic is forecast to be as follows:

During Stage 1 – Concrete pouring, Site Preparation and Groundworks

For 15 weekdays when the concrete foundations are poured simultaneously to general site preparation and groundworks being undertaken on the site, an additional 413 PCUs will travel on the study network. On these days the percentage increase in traffic volumes experienced on the study network will be between 2.6% on the N4 approaching Rathowen, and 40.1% on the L5828 approaching the site.

During Stage 1 - Site Preparation and Groundworks

For 240 weekdays, an additional 125 PCUs will travel on the local highway network resulting in a percentage increase in traffic volumes of between 0.8% on the N4 approaching Rathowen and 12.1% on the L5828 leading to the site.

During Stage 2 - Turbine Construction Stage – Delivery of large equipment using extended articulated vehicles

An additional 145 PCUs (made up of cars and large extended artic) will travel on the study network for 27 days. On the days this impact occurs volumes will increase by 0.9% on the N4 approaching Rathowen and by 14.1% on the L5828 leading to the site.

During Stage 2 - Turbine Construction Stage – Other deliveries using conventional articulated HGVs

For 15 days on the delivery route 60 additional PCUs (made up of cars and normal articulated HGV movements to the site and back) will travel on the study network. On these days the percentage increase on the study network will be between 0.4% (on the N4 approaching Rathowen) and 5.8% (on the L5828).

Once the facility is operational the traffic impact created by the 2 permanent employees will be negligible.

A comparison of traffic flow forecasts and link capacities shows that, with the exception of the N4, the surrounding road network will operate within capacity for all construction and operational stages of the development. It was determined that the N4 will operate over capacity without the Proposed Development, with the proposed Coole Wind Farm development resulting in a temporary marginal increase in traffic for the duration of the 12 to 18 month construction period.

An assessment of the traffic effects of a proposed grid connection route consisting of 26km of underground cable was undertaken for both the construction and operational stages of the Proposed Development. The assessment presented demonstrates that the traffic effects resulting from the construction of the cable route and associated connection to the existing Mullingar substations will last approximately 6 months along the public road if construction is undertaken simultaneously by two teams along the grid connection route.

The work associated with the proposed grid connection route will be transient and will impact on isolated sections of the road network at any one time, with the impacts forecast to be slight at most locations, and moderate at those locations requiring short period road closures. A comprehensive set of traffic management measures will be put in place during the construction period in order to minimise impacts to general traffic flow on the proposed route.

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.

RTÉ Transmission Network (operating as 2rn), stated that they have no microwave links in the vicinity of the proposed wind farm site. However, to mitigate against potential interference to viewers in the area, RTÉ have recommended that a protocol agreement be put in place for the wind farm development. 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 RTÉ television or radio reception as a result of the Proposed Development. A standard Protocol Document has been prepared by 2rn for the Proposed Development, which has been signed by Coole Wind Farm Ltd.

Of the scoping responses received from telephone, broadband and other telecommunications operators Enet, Three Ltd and Ripplecom noted links in the area and requested buffers and mitigation measures to be included in the wind farm design to mitigate potential impacts on the associated links. Further communications with these operators stated that the Proposed Development will not impact on their links with these buffers and mitigation incorporated into the design.

A scoping response was received from the Irish Aviation Authority (IAA). The requirements of the IAA include the following:

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

The closest aerodrome is at Abbeyshrule, Co. Longford, a small private airport that is located approximately 22.2 kilometres southwest of the nearest proposed turbine location, and therefore outside the range at which any interference issues would be expected.

In response to the lighting requirements requested by the IAA the turbines will be marked on maps, lit at night and entered into aircraft navigation databases and therefore can be avoided during flight.

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

Interaction of Effects

Chapters 5 to 14 of this Environmental Impact Assessment Report (EIAR) identify the potential significant environmental effects that may occur in terms of Population and Human Health, Shadow Flicker, Biodiversity (Flora and Fauna), Birds (Ornithology), Land, Soils and Geology, Water (Hydrology and Hydrogeology), Air and Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage) and Material Assets (Roads and Traffic, Telecommunications and Aviation), as a result of the Proposed Development as described in Chapter 4 of this EIAR. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these effects. The result of interactive effects may exacerbate the magnitude of the effects or improve them or have a neutral effect.

A matrix is presented in Chapter 15 to identify potential interactions of effects between the various aspects of the environment already assessed in this EIAR. The matrix highlights the potential for the occurrence of positive, neutral or negative effects during both the construction (C) and operational (O) phases. It is considered that the potential effects during the decommissioning phase will be similar to the construction phase effects but of a lesser magnitude. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

The potential for interaction of effects has been assessed throughout this EIAR, as part of the impact assessment process. While the work on all parts of the EIAR was not carried out by MKO, the entire project and all the work of all sub-consultants was managed and coordinated by the company. This EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and effects that potentially interact have been assessed in detail in the individual chapters of the EIAR and summarised in Chapter 15.

Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR and highlighted in Chapter 15.