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30 YEARS

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COOM GREEN ENERGY PARK, COUNTY CORK

VOLUME 1 – NON-TECHNICAL SUMMARY

Prepared for: Coom Green Energy Park Limited

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Date: December 2020

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1. INTRODUCTION

Fehily Timoney & Company (FT) has prepared this environmental impact assessment report (EIAR) on behalf of Coom Green Energy Park Limited, a joint venture company between Brookfield Renewables Ireland (BRIL) and Coillte CGA. Coom Green Energy Park Limited intend to apply to An Bord Pleanála for planning permission to construct the proposed Coom Green Energy Park, a up to 22 no. turbine wind energy development located in proximity to the Bottlehill Landfill site, approximately 12km south east of Mallow, and at the Nagles Mountains, approximately 5km south west of Ballyhooly, County Cork. The proposed project consists of the following which are assessed throughout this EIAR:

- Energy Park;
- Turbine delivery route (TDR);
- Grid connection route (GCR);
- Replant Lands

The proposed development will consist of a wind farm of up to 22 no. wind turbines, up to 2 no. electrical substations and a battery storage unit along with related civil and electrical infrastructure. The proposed wind turbines will have a maximum tip height of up to 169m and a maximum rotor diameter of up to 138m. The final turbines chosen may vary but will not exceed the dimensions above. Throughout the Environmental Impact Assessment (EIA) process, consideration of environmental impacts of the proposed development is based on the largest possible size of development i.e. assessment of the worst-case scenario. The potential output of the project is approximately 105 megawatts (MW).

The grid connection will consist of approximately 24.4km of underground cable, with approximately 16.7 km to be constructed within the existing road corridor. The connection will be made to the Barrymore electricity substation near Rathcormac. Turbines will be delivered to site by two separate delivery routes. One to the east from the M8 motorway through Ballyhooly, entering the site through existing forestry tracks which will be upgraded. The second delivery route is from the N20 from the west and enters the site at the existing Bottlehill Landfill entrance.

The statutory development description as per the Newspaper press notice seeking consent from An Bord Pleanála is as follows:

Coom Green Energy Park Limited seeks permission for a period of 10 years, for development consisting the construction of a wind farm and related works within the townlands of Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald) , Knuttery, Mullenaboree, Knockacullata, Knoppoge, Carrig, Glannasack, Knockdoorty, Lackendarragh North, Glashaboy South, Toorgarrif, Castleblagh, Ballyhooly South and Grange West, County Cork. The development will consist of:

- The construction of up to 22 no. wind turbines with a maximum tip height of 169 m and a maximum rotor diameter of 138 m and ancillary works including hardstanding areas;
- Upgrade of existing site tracks and the construction of new site tracks and associated drainage infrastructure both permanent and temporary;
- 3 no. on site borrow pits and associated ancillary infrastructure within the townlands of Tooreen South, Mullenaboree and Lackendarragh North;

- Construction of up to 2 no. onsite electrical substations including control buildings and electrical plant and equipment, a battery energy storage facility, welfare facilities, carparking and waste water holding tanks within the townlands of Knockacullata and Lackendarragh North;
- 3 no. Temporary construction site compounds and associated ancillary infrastructure including parking within the townlands of Tooreen South, Knockdoorty and Lackendarragh North;
- All associated underground electrical and communications cabling within private lands connecting the wind turbines to the 2no. proposed on-site substation;
- Upgrade of existing access junctions for temporary construction access from the local roads, L-1219-0 and L-1501 within the townlands of Tooreen South and Lackendarragh North;
- Permanent access junctions; from the local road L-1219-0 within the townland of Tooreen South, and from the local road L-1501 within the townland of Lackendarragh North.
- Erection of 2no. permanent meteorological masts with a maximum height of 100 m for the measuring of metrological conditions within the townlands of Tooreen South and Knoppoge;
- Temporary accommodation works at 6 no. locations to facilitate delivery of abnormal loads on the public road within the townlands of Grange West, Ballyhooly South, Glashaboy South and Castleblagh. These works will primarily relate to the cutting back of hedgerows and lowering of boundary walls and the temporary installation of hardcore including an off-site turning area;
- All related site works and ancillary development including landscaping and drainage;
- A 10 year planning permission and 30 year operational life from the date of commissioning of the entire wind farm.

The proposed grid connection to the national grid at Barrymore substation proposed on the public road is considered as part of the project's assessment in this EIAR but does not form part of this application for consent. Equally an environmental assessment has been carried out for replant lands at Moneygorm, Co. Cork and Ballard, Co. Wicklow which are also not included in the application for consent.

The lands at Moneygorm and Ballard form part of the overall project and relate to replant lands and these have been assessed in detail in Appendix 3.3 of this EIAR but are considered cumulatively with other elements of the wind farm project in this section.

In addition to the above works, biodiversity lands have been identified and shall be managed throughout the life of the proposed development under a Conservation and Habitat Management Plan. This can be found in Appendix 8-K of this EIAR.

1.1 Application and EIAR Requirement

Given the large scale of proposed project, the proposed development meets the mandatory requirements for EIA. Therefore, an EIAR has been prepared in accordance with the Planning and Development Regulations 2001 (as amended) and the European Union Directive 2011/92/EU (the EIA Directive) as amended by Directive 2014/52/EU.

The Planning and Development Act 2000 was amended in 2006 to require certain applications for permission for major infrastructure projects to be made directly to An Bord Pleanála, rather than to the local planning authority, as would have previously been the case.

This is known as Strategic Infrastructure Development (SID). As the proposed development will exceed 50 megawatts (MW) of power output, the project qualifies as SID. Pre-application consultation was completed with An Bord Pleanála under case reference No. PL04.303322. An Bord Pleanála issued a notice to BRIL and Coillte on 1st November 2019 indicating that the proposed development qualifies as SID.

As well as an EIAR, an Appropriate Assessment Screening and Natura Impact Statement has been prepared in compliance with Article 6 of the Habitats Directive. This report considers potential impacts on nearby nature conservation areas known as Special Protected Areas (SPAs) and Special Areas of Conservation (SACs).

1.2 EIAR Structure

The Environmental Impact Assessment Report (EIAR) is a report of the effects, if any, which a proposed development, if carried out, would have on the environment. The EIAR provides the planning authorities and the public with a comprehensive understanding of the project, the existing environment, the likely significant effects of the project and the mitigation measures proposed. The EIAR has been prepared in accordance with European Union Directive 2011/92/EU as amended by Directive 2014/52/EU (the EIA Directive).

The EIAR consists of the following chapters:

- Chapter 1 - Introduction
- Chapter 2 - Need for the Development and Alternatives Considered
- Chapter 3 - Description of the Proposed Development
- Chapter 4 - Policy
- Chapter 5 - EIA Scoping, Consultation
- Chapter 6 - Air Quality and Climate Change
- Chapter 7 - Noise and Vibration
- Chapter 8 - Biodiversity
- Chapter 9 - Land, Soils & Geology
- Chapter 10 - Hydrology and Water Quality
- Chapter 11 – Population, Human Health & Materiel Assets
- Chapter 12 – Shadow Flicker
- Chapter 13 - Traffic & Transportation
- Chapter 14 - Archaeology, Architectural and Cultural Heritage
- Chapter 15 - Landscape & Visual
- Chapter 16 - Telecommunications and Aviation
- Chapter 17 - Interactions of the Foregoing

The structure of the EIAR is as follows:

Volume 1 – Non-Technical Summary (NTS)

Volume 2 – Main EIAR

Volume 3 – Appendices to the Main EIAR

Volume 4 – Landscape and Visual Maps and Photomontages

An Appropriate Assessment Screening and Natura Impact Statement (NIS) has also been submitted with this application as well as a planning statement and planning drawings.

1.3 Permission Period

A ten-year consent is being requested for this development. That is, planning consent for the construction of the development would remain valid for ten years following the grant of permission. The applicant requests a grant of permission on the basis of a 30-year operational period from the date of commissioning of the wind farm.

1.4 Difficulties Encountered

There were no technical difficulties encountered during the preparation of this EIAR.

2. NEED FOR THE DEVELOPMENT AND ALTERNATIVES

2.1 Need for the Development

The proposed development of the Coom Green Energy Park is necessary to produce renewable energy for the Irish national grid in order to transition Ireland to a low carbon economy. The Coom Green Energy Park has an estimated capacity of approximately 105MW and a battery storage capacity of 50MW. The proposed development will play a critical role in providing renewable electricity in the Republic of Ireland, accounting for up to 2.8% of the current installed wind energy capacity (IWEA, 2020).

At a strategic level, the need for the Project is supported by International, European, and National environmental and energy commitments and policies. In Chapter 4 of this EIAR, a detailed analysis of these commitments and policies is outlined.

The Irish Government published the Climate Action Plan in June 2019 which sets ambitious actions to ensure our 2030 targets can be achieved. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date. According to a 2019 report by Climate Action Network Europe (CAN), Ireland is:

> *"Way off track with its greenhouse gas emission reductions in sectors such as transport, buildings, waste and agriculture (non-ETS) both for 2020 and 2030"*

The Climate Action Plan recognises that Ireland must make a significant increase in the current levels of renewable energy in the country.

It is estimated that the capacity of approximately 105MW of electricity from the proposed Coom Green Energy Park will result in the displacement of approximately 137,371 tonnes of CO_2 per annum.

Substantial new development will be required in Ireland to increase renewable energy production from 30% to 70%, as set out in the Climate Action Plan 2019 Most of this increase is likely to come from wind power. Moving from 2020 targets to 2030 and 2050 targets, wind energy development is required to increase substantially. This demonstrates the importance of and need for the proposed Coom Green Energy Park development.

The Coom Green Energy Park will assist in mitigating the effects of climate breakdown and will support and maintain onshore wind capacity. The Climate Action Plan seeks a total installation of 8.2 GW of onshore wind capacity by 2030. The Coom Green Energy Park has the potential to contribute to approximately 1.3% of this 2030 target.

The Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030 (DoCENR, 2015) sets out a framework to guide policy and actions that the government intends to take in the energy sector. The paper notes that "There will be substantial increases in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme". The proposed energy park aims to reduce dependence on imported fossil fuels and add to financial autonomy and energy stability in Ireland, further emphasising the need for the proposed development.

In addition to helping Ireland avoid significant fines and reducing Ireland's environmentally damaging emissions, the Coom Green Energy Park will also contribute positively to the national and regional economy.

Furthermore, research has shown that wind energy projects are inexpensive over a long period of time. A report published by Barringa in January 2019 states that:

> *"Our analysis indicates that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 will result in a total net cost to consumers, over 20 years, of €0.1bn (€63 million to be exact), which equates to a cost of less than €1 per person per year."* (Baringa, 2019).

2.2 Alternatives

At the outset of the project, the developers considered a range of technologies for the production and supply of renewable energy to the Irish national grid. The alternative technologies considered included:

- Bio-energy
- Off-shore Wind
- Solar Energy
- Tidal and Wave Energy

Ultimately, on-shore wind was chosen as the most viable technology option for the Irish energy market due to its advanced technological status, high power output, long-term economic benefit to customers and positive policy reinforcement as set out in the Climate Action Plan (2019).

Under the "Do-Nothing" scenario, the Coom Green Energy Park project would not go ahead, the development of wind turbines is not pursued, and the site remains in use as commercial forestry. In the "Do-Nothing" scenario, the prospect of creating sustainable energy through County Cork's wind energy resource would be lost at this site. The nation's ability to produce sustainable energy and reduce greenhouse gas emissions to meet EU targets and National targets, as set out above, would be stifled. This may result in the nation incurring significant financial penalties from the EU if targets are not achieved.

The proposed development will save approximately 137,371 tonnes of CO_2 emissions per annum which would otherwise be released to the atmosphere through the burning of fossil fuels in the "Do-Nothing" scenario. Importation of fossil fuels will continue, and Ireland's energy security will remain vulnerable. Furthermore, according to EirGrid Group's All-island Generation Capacity Statement 2019 – 2028 (Eirgrid, 2019), the growth in energy demand for the next ten years will be between 18% and 41%. A "Do-nothing" scenario would contribute to strain on existing energy infrastructure and may impact on economic growth if energy demand cannot be met.

Under the "Do-Nothing" scenario, the socio-economic benefits associated with the proposed development will be lost. These benefits include up to 168 no. jobs during the construction phase of the project, and up to 42 long term jobs once operational. Furthermore, under the "Do-Nothing" scenario the local community will not benefit economically from the community benefit fund associated with the project which could be used to improve physical and social infrastructure in the area.

The site selection process for the proposed development began at a macro level. This process firstly took account of relevant international, national and regional policies, as well as the principal environmental, planning and technical criteria that determine the feasibility and suitability of the existing environment to absorb wind energy developments.

The primary macro level considerations in the identification of a broad area for wind energy development included the following:

- Identification of environmental designations on a National Scale;
- Identification of areas of built Wind Farms in Ireland;
- Identification of Grid Capacity and Electricity Infrastructure;
- Relevant National and Regional Policies; and
- Status and availability of Coillte lands.

The micro level search criteria reflects the broad range of issues which can arise in wind farm development and allows for direct comparison across the study area to determine the relative suitability of potential wind energy development sites. A range of sites for wind energy development were considered by the applicant. Each site was subject to consideration on a series of criteria in order to determine their wind energy feasibility. The micro level search process is set out below in relation to the subject site.

The micro level search criteria included the following:

- County Development Plan Policies and Designations;
- Natura 2000 sites;
- Population Density;
- Access to major transport routes;
- Proximity to the National Electricity Grid;
- Wind Speeds;
- Land availability;
- Assessment of environmental sensitivities based on desktop review of available information.

Alternative project layouts were developed in order to avoid environmental sensitivities, minimise potential environmental impacts both on and off site and to maximise the wind potential on site. The design has been carried out in accordance with industry guidelines and best practice, namely the Department of Environment, Heritage and Local Government's (DoEHLG) Wind Energy Development Guidelines (2006), The Department of Housing, Planning and Local Government's (DoHPLG) Draft Revised Wind Energy Development Guidelines (2019), and the Irish Wind Energy Association Best Practice Guidelines (2012). The layout and design was an iterative process which took account of such criteria as:

- Set back from houses;
- Set back from designated sites;
- Set back from other constraints such as watercourses and power lines;
- Suitable wind speeds;
- Landscape and visual sensitivity;
- Ecology;
- Ornithology;

- Soils and Geology;
- Hydrology;
- Noise; and
- Cultural Heritage.

Constraints and environmental sensitivities were first identified, and buffers applied in order to determine appropriate areas within the site to accommodate development.

Initially, as part of the design process several different turbine heights were considered. The relationship between the height and density required to achieve a particular output was a key design consideration.

It was considered that the slightly increased sense of visual dominance imparted is preferable to the reduced level of permeability and increased visual clutter associated with a greater number of shorter turbines required to achieve the same output. Moreover, the perceived visual dominance of taller turbines is further offset by increased setback distances from residential receptors. In this regard, alternative turbine outputs were considered correlating to alternative turbine heights.

Over 16 alternative design options were considered during the project design stage. These were developed into 4 design iterations. The design iterations were influenced by potential environmental effects identified throughout the assessment, leading to the evolution of the project and the establishment of alternative design iterations

Initially, a layout of the maximum number of turbines was considered based on wind speed and wind wake analysis. This consisted of up to 39 turbines at the subject site. A preliminary feasibility assessment was then conducted to identify potential constraints. This included identification of ecological sensitivities, identification of residential properties, noise assessment and landscape visual impact assessment.

The layout was eventually reduced down to a 22-turbine layout after the constraints were considered and after multiple rounds of public consultation. Turbines were removed due to setback distances from dwellings, setback distance from watercourses and to protect the amenity of the Blackwater valley.

Design Iteration 4 (DI4), the final design iteration, was developed due to unexpected circumstances where certain lands were no longer available to the developer following establishment of DI3. An alternative design was required to relocate a number of the project's proposed wind turbines and associated infrastructure. The redesigned elements of the project aimed to maintain the non-significant impacts associated with DI3, while maintaining the proposed energy capacity in order to contribute to national renewable energy targets and reduction in emissions.

At the outset of the project, a range of potential grid connection options were considered in the vicinity of the CGEP site. Each option was first examined with respect to capacity. Once capacity was confirmed, the environmental impacts of the potential options were examined. The options considered are made up of existing grid infrastructure in proximity to the subject site. The developer consulted with EirGrid during the examination of options to identify capacity in the network and to seek advice on feasible options, as recommended by the draft Revised Wind Energy Development Guidelines (2019).

Both overhead line and underground cable connection options were considered. An overhead line connection was eventually ruled out due to potential impact on biodiversity and sensitive habitats. Following stakeholder consultation and discussion with Eirgird, connection to the nearby 110kV substation at Barrymore via underground cable was chosen as the preferred option.

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Proposed Development

Coillte in partnership with Brookfield Renewables, propose to develop Coom Green Energy Park in Co. Cork. It is proposed to supply power from the Energy Park to the Irish electricity network via underground cable to the substation at Barrymore.

The proposed turbines are located approximately 12km south east of Mallow, and at the Nagles Mountains, approximately 5km south west of Ballyhooly, County Cork. The proposed Coom Green Energy Park site includes lands contained within the following townlands: Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald) , Knuttery, Mullenaboree, Knockacullata, Knoppoge, Carrig, Glannasack, Knockdoorty, Lackendarragh North, Glashaboy South, Toorgarrif, Castleblagh, Ballyhooly South and Grange West, County Cork.

The site is located in a predominantly agricultural area, with elevations within the site ranging from 190m to 390m above sea level. The landcover is classified in Corine as pastures; coniferous forest, transitional woodland shrub and mineral extraction sites.

The energy park site is divided into three distinct areas identified as Bottlehill, Mullanboree and Knockdoorty.

The southern portion of the proposed development site (Bottlehill) is characterised by elevated lands with elevations of between 270m to 290m AOD with steep to moderate slopes to the west of the site boundary. Slopes within the proposed development and at proposed infrastructure locations generally comprise gentle to moderate slopes.

The central portion of the site (Mullenaboree) is also characterised by elevated lands with gentle slopes within the proposed development boundary. Elevations at this portion of the proposed development are generally lower than those at the south with elevations of between 220m to 260m AOD.

The north potion of the proposed development (Knockdoorty) comprises elevated lands sloping steeply in parts to the south. The Nagle Mountains ridgeline runs along the northern boundary of the proposed development site in an east-west direction reaching a maximum elevation of approximately 420m AOD.

The geology present within the development site and wider study area comprise of Till derived from Devonian Sandstones, Bedrock outcrop or subcrop and a limited extent of blanket peat. The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop indicated along the proposed route.

The associated grid connection route (GCR) will consist entirely of underground cable and will connect the on-site substations to an existing 110kV substation at Barrymore.

There will be two site entrances, one in the west and one in the east. They will each have their own turbine delivery route.

Felling of approximately 62.8 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation.

In total, 88 existing residential properties are located within 1.38 km of the proposed energy park wind turbines. There are 33 no. residential receptors within 1km of the proposed wind turbines. There are no receptors within 750m of the proposed wind turbines. The closest residential receptor is located 755m from a wind turbine.

In summary the proposed project will consist of the following:

- Erection of up to 22 no. wind turbines with a tip height of up to 169m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of approximately 15 km of new site tracks and associated drainage infrastructure;
- Upgrading of approximately 10 km of existing tracks and associated drainage infrastructure where necessary;
- 3no. on site borrow pits and associated ancillary infrastructure. (New access tracks serving borrow pits shall be reinstated following completion of construction);
- All associated drainage and sediment control;
- Installation of new watercourse or drain crossings consisting of pre-cast concrete box culverts.
- Re-use or upgrading of existing internal watercourse and drain crossings;
- Construction of up to 2 no. onsite electrical substations and associated compounds including:
    - Welfare facilities;
    - Electrical infrastructure;
    - Parking;
    - Wastewater holding tanks;
    - Rainwater harvesting
    - All associated infrastructure, services and site works including landscaping;
- 20 no. of Battery storage units and associated compound;
- Temporary accommodation works associated with the Turbine Delivery Routes to facilitate the delivery of turbine components;
- 3 no. Temporary construction site compounds and associated ancillary infrastructure including parking;
- Tree felling and associated replanting;
- Installation of approximately 30 km of medium voltage (20/33kV) underground cabling between the proposed turbines and the proposed on-site substations and associated ancillary works;
- Installation of approximately 7.7km of high voltage (up to 110kV) underground cabling between the proposed 2no. on site substations and ancillary works within private lands and public roads including up to 7 no. pre-cast joint bays;
- Installation of approximately 16.7km of high voltage (up to 110kV) underground cabling between the proposed on-site substations and the existing Barrymore substation and associated ancillary works within private lands and public roads. The proposed grid connection cable works will include 14 no. existing watercourse and drain crossings and the installation of up to 17 no. pre-cast joint bays.
- Communication cables and associated infrastructure;
- Erection of 2 no. permanent meteorological masts;

The proposed grid connection to the national grid at Barrymore substation proposed on the public road is considered as part of the project\'s assessment in this EIAR but does not form part of this application for consent. Equally an environmental assessment has been carried out for replant lands at Moneygorm, Co. Cork and Ballard, Co. Wicklow which are also not included in the application for consent.

The lands at Moneygorm and Ballard form part of the overall project and relate to replant lands and these have been assessed in detail in Appendix 3.3 of this EIAR but are considered cumulatively with other elements of the wind farm project in this section.

In addition to the above works, biodiversity lands have been identified and shall be managed throughout the life of the proposed development under a Conservation and Habitat Management Plan. This can be found in Appendix 8-K of this EIAR.

3.2 Wind Turbines

The proposed turbines will have a tip height of up to 169m. Detailed drawings, which accompany the planning application, show a turbine that may be used for the proposed development. However, the exact make and model of the turbine will be dictated by a competitive tender process which is informed by the energy production efficiencies of various turbines on the market at the time but will not exceed the maximum size envelope set out within the development description.

The wind turbines that will be installed on site will be conventional three-blade turbines, that will be designed to ensure the rotors of all turbines rotate in the same direction at all times.

The blades of a modern turbine are made up of glass fibre reinforced polyester. They turn at between 5 and 15 revolutions per minute depending on wind speed and make of turbine.

A turbine begins generating electricity at a wind speed of 3 to 4m/s depending on turbine type, with rated power generation at wind speeds of approximately 12 to 14m/s. The turbines usually shut down at wind speeds greater than 25m/s, although some machines are designed to operate at up to 30m/s.

The tower of the turbine is a conical steel tube. It is generally delivered to site in four or five sections. The first section is bolted to the steel base, which is cast into the concrete foundation. The shape and size of the foundation can vary, however it is approximately 22m in diameter and approximately 3m in depth.

The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is around 4-5m in diameter, tapering to approximately 2-3m, where it is attached to the nacelle. The first floor of the tower is approximately 2-3m above ground level it is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance.

The turbine will have a transformer located within the tower. The turbine will generate electricity at approximately 660 volts. The turbine transformer will step up the voltage to approximately 33kV to reduce the electrical loss on the cabling connector circuits that connect to the site substation.

The turbines have a multiple painted coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background, minimizing visual impact,

3.3 Turbine Transport

Turbine deliveries will be from Ringaskiddy and will be delivered along two distinct routes. One route to the west of the site, servicing the Bottlehill and Mullenaboree parts of the site and a second route to the east, servicing the Knockdoorty part of the site. All deliveries will first travel from Ringaskiddy to the Dunkettle Interchange via the N28 and the N40.

Deliveries to the west of the site will take the N8 to exit at Dunkettle. They will travel to Silversprings and take the R635 around the north side of Cork City. At Blackpool, the components will join the N20 and turn off at the junction with the L-1217 towards Bottlehill Landfill. In order to access the site via the existing Coillte entrance point on the L-1219-0, turbine delivery vehicles shall pass the final junction to the site entrance between the L-1217 and L-1219-0, turn at a temporary hard standing in Coillte land at Glashaboy South which is located approximately 2km south-east of the proposed site entrance and make their final approach to the site from the east and south. At the temporary turning area, wind turbine blade components shall be transferred via crane from standard extendable trailers to 'Superwing' blade lifting trailers which will allow them to negotiate the L-1217/L-1219-0 junction.

Deliveries to the east of the site will travel north along the M8 from Dunkettle. At Junction 14 on the M8, the turbine components will exit the motorway and travel south into Fermoy. Once the turbines reach Fermoy, they will travel west along the N72 and turning south just east of Ballyhooley. From there they will follow local roads across the Blackwater River and to the site entrance at Lackendarragh North.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. Any accommodation works will be carried out in advance of the turbine deliveries, following further consultation and agreement with the local authority.

3.4 Drainage

The drainage system will be constructed alongside all turbine hardstands, internal access tracks, substation and the temporary construction compound. The drainage system for the existing tracks and roads will largely be retained. Where the roads require widening, this will involve the slight re-location of existing roadside swales to allow for widening. The drainage systems will include settling ponds, swales and silt traps.

3.5 Construction Phase

The construction sequence will be as follows. Tree felling, upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. This will be followed by the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network and off-site connection works to the national grid will be completed. It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18-24 months.

Access tracks to facilitate turbine and material deliveries for CGEP shall consist of the construction of approximately 15 km of new site tracks and associated drainage infrastructure. The project will incorporate the upgrading of approximately 10 km of existing forest tracks.

For cable trenches located in public roads, the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed above the ducts and the two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority.

A similar construction methodology will apply for cable trenches laid within site access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

There is 1 no. new watercourse crossing required for new access tracks within the proposed development site. It is proposed to construct a pre-cast concrete box culvert at this location to minimise the environmental impacts. It is also proposed to replace 1 no. existing pipe culvert with a box culvert at one location.

Horizontal Directional Drilling will be employed at up to 4 no. locations along the grid connection route as part of the development as shown on the site layout plans. 3 no. of these locations will be for the crossing of existing watercourses. It is expected that all minor watercourse and drain crossings within the site will be crossed using piped culverts.

A turbine hardstanding area will be constructed at the base of each turbine to provide a solid area for the main installation crane that will be used to erect the turbine and for the assembly of the turbine. The stone required for the construction of the internal access roads will be sourced from quarries in the vicinity and 3 no. on-site borrow pits

The base of the foundations are excavated to competent bearing strata or where this depth is excessive piling may be required. However based on site investigations carried out to date, it is considered that all turbine foundations shall be shallow base types and founded on either rock or glacial till. This will be confirmed with further site investigations prior to construction. Excavated soil will be placed in the temporary storage areas adjacent to the turbines. Formwork and reinforcement are placed, and the concrete poured. Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material.

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

Two permanent meteorological masts will be installed on site at Bottlehill and Knockdoorty which will replace two existing met masts. These are both lattice structures of 100m height which are fixed to the ground by guy wires.

The Developer, in conjunction with appointed contractor, will prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction. A Waste Manager will be appointed, who will have overall responsibility for the management of waste on site. Waste be will be disposed of at nearby licensed waste management facilities.

3.6 Operation, Maintenance and Decommissioning/Reinstatement

During the operational period, the turbines will operate automatically on a day to day basis, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The turbine manufacturer or a service company will carry out regular maintenance of the turbines.

Scheduled maintenance will typically occur twice a year. The operation of the wind turbines will be monitored remotely, and a caretaker will oversee the day to day running of the proposed wind farm.

The expected physical lifetime of the turbine is approximately 30 years, and permission is sought for a 30-year operation period commencing from full operational commissioning of the wind farm.

With longer permitted operational period, the lower the cost will be, and the better the competitiveness of the wind farm with other electricity generators.

Following the end of their useful life, the wind turbines subject to planning permission may be replaced with a new set of turbines or the site may be decommissioned. On decommissioning, cranes will disassemble the above ground turbine components which would be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process. The foundations will be covered over and allowed to re-vegetate naturally if required. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise and vibration and dust. It is proposed that the internal site access tracks may be left in place, subject to agreement with Cork County Council and the relevant landowners.

The proposed on-site substations shall be taken in charge by ESBN/Eirgrid upon completion and shall be left in place forming part of the national electricity network.

Underground cables will be cut back and left in place.

4. POLICY AND LEGISLATION

This Chapter of the EIAR outlines current EU, national, regional and where relevant local policy and legislation relating to the proposed Coom Green Energy Park Development.

Relevant international policies in relation to renewable energy and the need to prevent climate change include the United Nations Framework Convention on Climate Change and the Kyoto Protocol. EU Directives and Policies include:

- Directive on the Promotion of the Use of Energy from Renewable Resources
- European 2020 Strategy for Growth
- Europe 2020 Indicators – Climate Change and Energy
- 2030 Climate and Energy Framework
- A Roadmap for Moving to a Competitive Low Carbon Economy in 2050
- Recast Renewable Energy Directive (RED2)
- European Green Deal

Relevant National Policies considered include:

- Project Ireland 2040: The National Planning Framework
- Project Ireland 2040: National Development Plan 2018 – 2027
- Climate Action Plan (2019)
- Climate Action and Low Carbon Development Act 2015
- Ireland's Greenhouse Gas Emissions Projections 2018 – 2040
- Climate Action and Low Carbon Development (Amendment) Bill 2020

Regional and Local plans have also been considered including the Cork County Development Plan 2014 which sets out the wind energy strategy for the county. The proposed development is located in an area **'Open to Consideration'** for wind energy development.

From a review of relevant policies, it is clear that there is significant international, European, national and local policy support for a move to renewable energy technologies. 2020 and 2030 EU renewable energy targets have been supported by the national Climate Action Plan (CAP) (2019) which aims to steer the country towards clean energy and reduce emissions with a target of 70% renewable electricity by 2030. The CAP sets out an objective to more than double Ireland's onshore wind energy capacity to 8.2GW by 2030, greatly reducing the nation's dependency on fossil fuels.

Therefore, the policy context for the Coom Green Energy Park site and surrounding area is considered favourable for the proposed Coom Green Energy Park, both from a national policy perspective with regard to renewable energy provision, and at a local level with respect to designations and the ability for the site to accommodate the proposed development.

5. EIA SCOPING, CONSULTATION AND KEY ISSUES

This section of the EIAR describes the EIA scoping process and the stakeholder consultation that was conducted throughout the development of the Coom Green Energy Park (CGEP) project. The purpose of the EIA scoping process is to identify the key points and issues which are likely to be important during the environmental impact assessment (EIA) and to eliminate those that are not. This is conducted by preparing a report detailing the proposed development and sending it to a list of consultees such as various governmental departments, non-governmental organisations, environmental bodies, interested parties and key stakeholders, including telecommunication companies and aviation authorities which operate in the area of the CGEP.

A scoping request letter which included a description of the proposed development, draft of the preliminary site boundary and preliminary table of contents was forwarded to consultees on the 16th of August 2018. The recipients included the Local Authority, Government Departments, non-governmental organisations (NGOs), interested parties and key stakeholders. A more detailed scoping report was issued to the same consultees on the 25th of June 2019 detailing the second design iteration. Responses from the consultees identified a range of observations which have been taken into consideration in the preparation of the respective chapters of the EIAR.

Stakeholder consultation took place with a range of groups and individuals. Two meetings were held with Cork County Council. The first meeting was a pre planning style meeting in order to inform the authority of the project and to receive observations regarding design and potential environmental impacts. A second meeting was held with Cork County Council 7 months later to present the updated layout. Two meeting were held between a Cork County Council Road Engineer and a Senior FT Engineer. The aim of the meetings was to discuss potential impact on the surrounding road network in the vicinity of the proposed CGEP. Two meetings were also held with key members of the design team and An Bord Pleanála (ABP) at their offices in Dublin. In the first meeting the applicants presented the development of the project to ABP. In the second meeting, the applicants presented progress made on the proposal since the initial meeting. This was focused on issues raised by the Board's representatives in the first meeting. Other consultation with Inland Fisheries Ireland and NPWS was also carried out.

Community consultation was conducted in line with the Code of Practice for Wind Energy Development in Ireland. It began in March 2018. A Community Liaison Officer (CLO) was appointed to be the main point of contact for the local community. The CLO's role included door to door consultation with community members within 2km of the proposed development, distribution of project materials to community members, follow up meetings with community members where requested, liaison between local residents and the project team, communication of any project updates and circulation of information regarding upcoming public events.

Project information was distributed by leaflet drop to houses within a 5km radius of the proposed development. Furthermore, community information events and technical workshops were held to provide information about the project, to discuss the details of the project with the public and to inform the design of the project through feedback from the community. A dedicated project website was set up which presented updates on the project and hosted a platform for the downloading of project information. The project website also included an email address to relay any queries and the phone number of the CLO.

Observations and issues that arose during the scoping and consultation process have informed the design, assessment and mitigation measures proposed as part of this project.

6. AIR AND CLIMATE

This section describes the existing air and climate environment of the proposed Coom Green Energy Park (CGEP) project as a whole. It examines the various elements of the construction, operational and decommissioning phases of the proposed green energy project which consists of up to 22 no. wind turbines, grid connection route, turbine delivery route (TDR), internal site access tracks, cable trenching and electrical infrastructure and associated works which have the potential to impact on air quality and climate. Mitigation measures and the residual impacts after the proposed mitigation measures have been implemented are also described. A cumulative impacts assessment is also carried out.

6.1 Air

In order to protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants and limits have been set for nitrogen dioxide, nitrogen monoxide, particulate matter, lead, carbon monoxide and benzene. There are no statutory limits for dust deposition. A review of existing air quality monitoring data undertaken by the Environmental Protection Agency was carried and used to characterise the existing environment.

To predict potential air impacts the Coom Green Energy Park construction site was assessed and categorised according to Transport Infrastructure Ireland criteria which categorises traffic movements and potential dust deposition as a result of the construction traffic of a project. The principal source of potential air emissions will occur during the construction of the energy park and placement of the grid connection route which will produce dust. Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source and may cause dust soiling in the surrounding area. Following the implementation of mitigation measures, the Coom Green Energy Park may result in slight to moderate residual impacts arising from fugitive dust emissions during particular construction activities. These will be localised in nature and as they will be associated with particular elements of the construction phase, they will be temporary in nature and will not result in any permanent residual impacts.

Traffic emissions were not taken into account when predicting air quality for the Coom Green Energy Park as traffic increase numbers will fall below the screening criteria set out in guidance, on which the Transport Infrastructure Ireland guidance is based. Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be negligible.

Once the proposed Coom Green Energy Park is constructed there will be no significant direct emissions to atmosphere. In terms of decommissioning, traffic emissions and dust also would be significantly less than the construction phase and would potentially result in a slight temporary impact. There will also be emissions from machinery at the energy park, however, this is not likely to result in significant impacts.

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the proposed energy park and grid connection route and was being constructed at the same time. Following a review of developments, it is considered that this is not likely to act cumulatively in terms of dust during construction. Cumulative impacts may arise if the construction period of other projects occurs simultaneously with the construction of the proposed energy park and grid connection route.

However, provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality. In terms of the waste facility at Bottlehill, there is potential for dust to arise and act cumulatively with any dust generated during the construction stage of the proposed energy park and grid connection route. However, following the implementation of mitigation measures and daily visual checks during construction, no significant effects are likely to occur.

Mitigation measures have been outlined for dust during the construction phase of the Coom Green Energy Park. A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 3.1. of the EIAR. The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP. As the operation of the Coom Green Energy Park will have positive impacts on air quality, mitigation measures for the operational phase are considered unnecessary. Measures for the decommissioning phase will be similar to those laid out for the construction phase.

6.2 Climate

Carbon dioxide is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence climate change. Under the Kyoto Protocol and the Doha Amendment, Ireland has committed to reduce greenhouse gas emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020. At the Paris climate conference which Ireland has adopted and is legally binding. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C (degrees Celsius) above pre-industrial levels and to limit the increase to 1.5°C. Under the agreement, Governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

A desk-top study assessment was undertaken of available climatic information to characterise the existing environment. There is the potential for greenhouse gas emissions to the atmosphere during the construction phase of the energy park such as those arising from construction vehicles, the use of on-site generators, pumps etc. The potential climatic impacts arising from these emissions were assessed in terms of carbon losses and savings as a result of the proposed construction and operation of the energy park, by using a carbon calculator provided by the Scottish Government for wind farm development on peat. The energy park will, during construction, result in carbon dioxide losses. These are due to the manufacture, construction and decommissioning of the turbines, losses due to reduced carbon fixing potential, losses from soil organic matter and losses due to felling forestry. However, payback time is estimated at approximately 1.6 years. It is estimated that the Coom Green Energy Park will result in the net displacement of approximately 305,268 tonnes of carbon dioxide annually. From an operational perspective, the Coom Green Energy Park will displace the emission of carbon dioxide from other less clean forms of energy generation and will assist Ireland in meeting its renewable energy targets and obligations.

In terms of climate, the proposed Coom Green Energy Park will act cumulatively with other renewable energy projects in reducing carbon dioxide emissions by displacing fossil fuel in the production of electricity, resulting in a slight-moderate positive impact on climate. There will be residual positive impacts from the operation of the proposed Coom Green Energy Park in terms of the displacement of fossil fuel energy generation with renewable energy.

7. NOISE AND VIBRATION

The proposed Coom Green Energy Park is located within a rural environment, in an area comprising of forestry and agricultural activities.

Baseline noise monitoring has been carried out at eighteen receptor locations surrounding the proposed Coom Green Energy Park development to establish existing levels of background noise in the vicinity of the proposed energy park and to then enable appropriate noise limits for the site to be derived. The standard approach to derivation of noise limits is to carry out baseline measurements at several noise sensitive locations (NSL) around the proposed site. Noise limits are then derived for the properties at which the measurements were carried out based on the results of these measurements. As it is not usually possible to carry out measurements at every NSL, NSLs near to the measurement property are then assigned the same limits as the measurement location. The operational impact at each of the measurement locations was appraised in accordance with the Institute of Acoustic's Good Practice Guidelines.

The chosen noise monitoring locations were representative of the different noise environments in the vicinity of the proposed Coom Green Energy Park development in addition to being located at some of the closest dwellings to the proposed wind farm development. The baseline noise monitoring was used to derive appropriate noise limits according to the Department of the Environment, Heritage and Local Government DoEHLG *Wind Energy Planning Guidelines*.

Potential noise and vibration impacts during the operational phase and construction phase were assessed.

On-site construction noise is predicted to be greatest from works associated with the borrow pits. With mitigation measures, on-site construction phase noise and vibration levels will be below the relevant limits. On-site construction works are slight impact and temporary in duration. There is potential for temporary elevated noise levels due to the grid connection works but these will be limited to a small number of dwellings. There are zero dwellings within 10 m of the grid connection works, 12 dwellings within 25 m, 47 dwellings between 25 – 50 m and 4 dwellings between 50 - 100 m. However, elevated noise levels from these works will be for a temporary duration at a particular property (i.e. less than 3 days). The works are expected to have a significant temporary impact.

Operational noise from the proposed turbines are predicted to exceed the noise limits at seven receptors. Note: the predicted noise levels are for a worst-case scenario with noise sensitive receptors downwind of the proposed wind farm. In practice, receptor locations will not be downwind of all noise sources and the actual noise levels will be lower than those predicted. New sources of noise will be introduced into the soundscape and it is expected that there will be a long-term moderate significance of impact on the closest dwellings to the proposed energy park. In order to demonstrate compliance, mitigation measures need to be employed to ensure the daytime and night-time noise limits are met.

To mitigate noise impact some of the turbines may need to be operated in noise reduced modes of operation and this will ensure compliance with derived noise limits.

Draft Revised Wind Energy Development Guidelines (December 2019) published by the Department of Housing, Planning and Local Government proposes amendments to the Wind Energy Development Guidelines 2006 and '2019 Draft Guidelines' were out to public consultation until the 19th February 2020 and may be subject to further revision. The Wind Energy Development Guidelines (2006) are current. For completeness, the proposed development has been assessed against the 2006 Guidelines and the '2019 Draft Guidelines'.

The cumulative impact from the proposed Coom Green Energy Park and other nearby projects was considered. There is a landfill in the vicinity of the site that has been constructed but is not operational. Should the landfill become operational during construction of the wind farm there is a potential noise limit exceedance due to increased traffic on local roads. However, this will depend on the construction phase. If construction of the energy park is approved a traffic management plan will be put in place prior to construction that will address the requirements of any relevant conditions and any additional mitigation measure conditioned by An Bord Pleanála.

There is a single wind farm permitted 1km from the site at Moneygorm. This has not yet been constructed but was accessed cumulatively with the energy park and the landfill during the operational phase of the energy park. The daytime noise limit could be exceeded at two receptors nearby to the wind turbine at Moneygorm in certain wind speeds. This is again a worst case scenario and assumes the receptor locations are downwind of all wind turbines which is not physically possible practice. Nonetheless a mitigation strategy has been developed to ensure compliance with the day time noise limit.

With mitigation in place no significant impacts from noise and vibration are anticipated.

8. BIODIVERSITY

This EIAR chapter assesses the potential for the construction, operation and decommissioning phases of the Coom Green Energy Park (CGEP) project to result in significant effects on Biodiversity.

Comprehensive desk and field studies were conducted to identify Important Biodiversity Features on the CGEP site and within the potential zone of influence of the project. Desk and field studies commenced in 2016 and were ongoing to 2020 to inform this assessment. Studies included a thorough review of available information and consultation with Inland Fisheries Ireland, Development Applications Unit and National Parks and Wildlife Services. The field surveys and desk studies were undertaken by highly experienced ecologists from Inis Environmental Consultants Ltd with, in addition, a range of external experts in bat, aquatic and avian ecology. The surveys conducted included multiyear bird surveys based on best practice methods (SNH 2017), habitat surveys, invasive species surveys, large mammal surveys, marsh fritillary, bat, fishery, freshwater pearl mussel and other aquatic ecology surveys.

The desk study identified a hydrological connection between CGEP and the Blackwater River (Cork/Waterford) SAC and Blackwater Callows SPA. The proposed development is also positioned upstream of a number of NHAs and pNHAs within the River Blackwater Valley. There is therefore an important hydrological connection (*ca.* 0.6km separation distance) between the proposed development site and the Blackwater River (Cork/Waterford) SAC. Key species considered in the assessment include Atlantic salmon and freshwater pearl mussel. The downstream (hydrologically connected) River Blackwater is of International Importance and hence this river and associated aquatic biodiversity is identified as an Important Ecological Feature.

No habitats of international, national or county importance occur in the immediate vicinity (site) of the CGEP. The majority of the CGEP site is commercial forestry plantation, while the grid connection is located along a public road or forestry. Habitats on the site where development works are proposed are predominantly not of ecological importance outside small areas of linear scrub and some areas of species poor wet grassland which are of local importance. The Turbine delivery route works also require some small scale localised vegetation trimming.

Bird species identified on CGEP site as important ecological features and subject to detailed surveys include breeding hen harrier and potentially goshawk. Other common bird species also use the site.

The site is regularly used by common bat species including leisler's bat and soprano pipistrelle. Terrestrial large mammals and other fauna species identified include otter (off site), badger, Irish hare, fallow deer and amphibians. There is also the potential for the spread of invasive species including; Japanese knotweed and Himalayan balsam, though none were recorded on the main GGEP site.

Detailed mitigation measures are provided within the main body of the EIAR to be put in place to protect downstream water quality, birds, bats, habitats and prevent spread of invasive species.

Following identified detailed mitigation to reduce possible impacts to important ecological features outlined above, the following conclusions were determined.

No significant residual effect are identified on any protected European site (SAC, SPA) or nationally designated site (NHA, pNHA). No significant residual effects are identified on fisheries, freshwater pearl mussel and other sensitive aquatic biodiversity due to CGEP.

No significant changes will arise to habitats of local ecological value on the site as some additional areas previously covered in coniferous forest will be allowed to develop into semi natural grassland/ scrub.

Effects on Avifauna associated with habitat loss, disturbance or displacement and collision were assessed in detail. The residual impacts on important bird species including hen harrier have been evaluated and characterised as not being significant throughout the construction, operation and decommissioning phases of the CGEP. Hen Harrier nesting areas identified back to 2014 are avoided and a buffer of at least 0.5k is retained.

A review of other plans and projects in the surrounding area was undertaken, exploring the possibility of cumulative impacts with other projects and plans on relevant Important Ecological Features. No indirect or direct cumulative impacts were identified.

The CGEP development will be constructed, operated and decommissioned in strict accordance with the design and mitigation described in the EIAR and as such no significant residual effects are likely to local biodiversity or the downstream hydrologically connected River Blackwater (internationally important).

9. LAND, SOILS AND GEOLOGY

The Quaternary Geology underlying the proposed Coom Green Energy Park, found on Geological Survey of Ireland mapping, comprises of Till derived from Devonian sandstones (TDSs); Bedrock outcrop or sub-crop (Rck); and Limited extent of blanket peat (BktPt). The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop indicated along the proposed route.

The Groundwater Vulnerability within the proposed Coom Green Energy Park boundary is classified by the GSI as ranging from 'High' to 'Extreme' with areas of exposed bedrock present. At the eastern extent of the proposed grid connection the vulnerability classification is reduced to 'Moderate'. Based on the GSI aquifer vulnerability mapping, overburden deposits are generally between 3 and 10m deep in the central portion of the site; generally, 3 to 5m deep in the north, east and south-east of the site; and under 3m deep in the extreme west and north east of the site.

The study area of the project is located within 3 groundwater bodies (GWB). The Coom Green Energy Park and majority of the grid connection is located within the Glenville GWB. The entrance road to the adjacent Bottlehill Landfill site is underlain by the Ballinhassig GWB. The eastern extremity of the proposed grid connection route crosses the Tallow GWB. The Ballinhassig, Glenville and Tallow GWBs are classified as having 'Good' status in terms of quality and quantity.

Based on a review of the GSI Groundwater Wells and Springs database there are 6 No. Groundwater Wells recorded (500m to 1km accuracy) within 1km of the proposed development site. Following discussions with local residents and site walkovers during July and August 2019 a further 1 No. groundwater supply well and 1 No. spring used for private water supply was identified.

Site Investigations confirm that the Topsoil ranged from soft, peaty Topsoil to loose loamy Topsoil with peaty SILT and gravelly SILT deposits also encountered to a maximum depth of 0.6m below ground level. Localised and thin amorphous Peat deposits were also noted at some locations and are limited in extent and thin with typical thicknesses of between 0.1 – 0.6m.

Bedrock was encountered in trial pits and boreholes at depths of between 2.7m to 10.8m below ground level and were typically described as medium strong thinly bedded greenish brown slightly sandy fine-grained SILTSTONE.

No risk is posed to slope stability along the grid connection route. Ground levels at the western cluster (Bottlehill and Mullenaboree) comprise elevations of between 220m and 290m above sea level. Slopes within the western cluster generally comprise gentle slopes of between 1.7 to 3.4 degrees. Ground levels at the eastern cluster (Knockdoorty) comprise elevations of up to 428m above sea level. Slopes recorded at proposed turbine locations at the eastern cluster range from gentle (3.4 degrees) to 'moderate to steep' with maximum slope angles of 10.2 degrees.

From a review of the GSI Landslide Susceptibility database, the proposed development is generally located in areas of 'Low' susceptibility to landslides. The exceptions are T20 and T21 (Moderately High) and T22 (Low to Moderately Low). However, no evidence of slope instability was observed at the site following investigation and there are no historical records of landslide activity within or close to the site.

During construction potential impacts include soil erosion, soil compaction, ground water pollution slope failures. The overall magnitude of the potential direct impacts associated with the construction phase of the proposed development, prior to mitigation, is considered to be a Short Term, Negative Impact of Slight to Moderate Significance.

Potential operational impacts relate to potential leaks and spills of fuel, oils and chemicals and the impact of same on ground water. The magnitude of these potential impacts, prior to mitigation, is considered to be of Slight Significance.

Cumulative impacts associated with land, soils and geology are not considered to be significant.

Mitigation measures during construction include the development of a comprehensive surface water management system which is incorporated into the Construction Environmental Management Plan which is included in the EIAR.

Excavated material will be reused onsite for construction of access tracks, hardstands, landscaping and reinstatement, in order to avoid materials being transported off-site. These materials will be temporarily stored in a level area adjacent to the construction phase excavations prior to reuse.

To avoid compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that peatland / soils outside the work area is not damaged. Excavations will then be carried out from access tracks, where possible, as they are constructed in order to reduce the compaction of soft ground.

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of construction activities, at staggered intervals at locations where the peat deposits occur. This is focused at turbine 4 where thin blanket peat has been identified. Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.

Likely impacts on land, soils and geology during the operational phase relate to potential spills and leakage of oils, chemicals and fuels. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. The management of oils and fuels will include:

- Oils and fuels on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or oils will be immediately contained and properly disposed of off-site.
- Waste oils and fuels will be collected in leak-proof containers and removed from the site for disposal.
- Appropriate spill control equipment will be kept in the construction area and in each item of machinery.

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

Residual impacts associate with land, soil and geology relate to the excavation of fill materials from local quarries and the disposal of material deemed unsuitable for reuse. This will put a demand on existing quarries and available void space at licensed facilities which will impact on the long term capacity of these facilities. Following implementation of the proposed mitigation measures, there are no significant residual impacts associated with land, soil and geology.

10. HYDROLOGY AND WATER QUALITY

Surface runoff from the site drains to the Toor River, Coom River, Tooreen North, Inchinanagh and Bunnaglanna watercourses, and the Bride River. The Toor River is a tributary of the Coom River. The Coom River and Inchinanagh and Bunnaglanna watercourses are tributaries of the Bride River.

The national flood hazard mapping (available at www.floodmaps.ie) does not indicate any record of historical flooding on the wind farm site. There are no areas defined as 'benefitting lands' within the Coom Green Energy Park in the OPW flood hazard mapping.

The water quality of the Bride River and its tributaries is 'Good'. River waterbody risk for the Bunnaglanna and Inchinanagh watercourses is under review. River waterbody risk for the rest of the watercourses on the site are classified as 'Not at Risk'.

The site is not situated within any environmentally designated areas, however surface water running off the site drains into the Bride/Bunaglanna Valley (000079) Natural Heritage Area (NHA) and Blackwater River (Cork/Waterford) (002170) Special Area of Conservation (SAC). The development does not traverse any Special Protection Area (SPA). The closest SPA, Cork Harbour SPA (004030), is approximately 17.6km southeast of the site.

Potential construction impacts include impacts associated with Tree felling, new access tracks and upgrade of existing tracks, turbine hard-standing areas, the on-site substation and other new, hard surfaces have the potential to contribute to an increase in runoff.

The hydrological environment of the Coom Green Energy Park is considered to be of 'high' sensitivity for receptors draining to the Bride River. The effects of the increase in runoff has negligible magnitude on receiving waters because estimated increases in runoff are low compared to the flows of receiving waters. The overall estimated increase in the runoff due to the development is 0.234 m^3/s (or 0.06 %) is not significant.

During construction, the relatively low increase in runoff has however, the potential to cause soil erosion and consequent sediment release into the receiving watercourses. Possible potential indirect impacts on surface water quality during tree felling and construction activities include increased sediment in watercourses, increase in nutrients from tree felling, blockages in cross drains could lead to flooding, suspended solids could affect aquatic fauna and habitats, fuel leaks or spills could affect watercourses, wet concrete could affect receiving waters.

The main hydrological impact of the development during operation is estimated increased runoff. Due to the insignificance of the increase in runoff from the development, the grassing over the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of site operations, there is a negligible risk of sediment release to the watercourses during the operational stage.

In the event of decommissioning of the development, activities would take place in a similar fashion to the construction phase. Potential impacts would be similar to the construction phase but to a lesser degree.

There would be increased trafficking and an increased risk of disturbance to underlying soils at the wind farm, during the decommissioning phase, in this instance, leading to the potential for silt laden run-off entering receiving watercourses from the wheels of vehicles.

Any such potential impacts would be likely to be less than during the construction stage as the drainage swales would be fully mature and would provide additional filtration of runoff. Any diesel or fuel oils stored on site would be bunded.

Mitigation includes the Proposed drainage measures. These have been designed to reduce and protect the receiving waters from the potential impacts during the construction of the proposed development are as outlined in the chapter These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into the nearby watercourses to which the proposed development site drains. The main mitigation measures are the use of stilling ponds, silt fencing, monitoring of works by a suitably qualified person, silt traps, use of cross drains, swales, proper storage of fuels and oils and designated refueling areas.

Trees will be felled away from aquatic zones where possible. Brash mats will be used as necessary on any off-road harvesting routes, removed and replenished if they become worn. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible.

When operational, the development will have a negligible effect on surface water quality as there will be no further disturbance of soils post-construction. During the operation stage, small quantities of oil will be used in cooling the transformers associated with the facility. There is therefore a potential for small oil spills. Risks of potential oil leakage and pollutions draining to the watercourse from the installed transformer is mitigated with transformer interceptor bund wall.

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. The maintenance of the development will incorporate effective maintenance of the drainage system.

Following the implementation of mitigation measures, the residual risk to the receiving watercourses would be ‘Imperceptible’ and ‘Not significant’ during the construction, operation and decommissioning stage of the development.

11. POPULATION, HUMAN HEALTH AND MATERIAL ASSETS

11.1 Population

The study area considered for this assessment includes the Electoral Divisions which the proposed project is located in including the grid connection works. The population statistics of the study area are compared to the statistics of Cork County, Cork City and The State in order to determine population trends.

The population of the study area is 5,606 and the population of the population of the Grid Route Area is 4,932 (2016 Census). The population density of the study area is far less than the state or county-wide average indicating a low population in the immediate area of the Coom Green Energy Park.

The construction stage will bring short-term/temporary population growth in the study area during working hours where a potential increase of between 126 and 168 workers will attend the site. This growth is associated with daily construction work and therefore the population of the study area will increase daily during construction hours and return back to normal outside of working hours. It is unlikely that the construction stage will permanently impact population trends of the study area or grid route area.

The operational phase of the Coom Green Energy Park will potentially provide between 31 and 42 long term jobs. Although only a small proportion of these jobs are likely to be based in the study area, the operational phase will give rise to temporary, slight population increase in the study area during working hours as a result of operations and maintenance. This impact is expected to be imperceptible.

The potential impacts associated with the decommissioning phase in relation to population and demographics will be similar to those associated with construction phase but of a reduced magnitude. It is not likely that the decommissioning phase will result in any permanent impact to population in terms of changes to population trends, density, household size, or age structure.

As there will be no significant impact on population trends, density, household size or age structure, no mitigation measures are required.

The residual effects of the proposed development with respect to population are associated with operation and maintenance jobs during the operational phase of the CGEP. This is likely to result in a temporary slight population increase in the study area during working hours. As per the assessment of operational impacts, any impact to the population of the study area in terms of changes to population trends, density, household size, or age structure will be imperceptible. It is therefore unlikely that long term residual impacts will occur to population and demographic trends as a result of the proposed development.

11.2 Socio-Economics

It is estimated that between approximately 126 and 168 jobs will be created during the construction stage of the project which is expected to last up to two years. This will cause a direct short-term, positive impact on the local economy, bringing significant benefits to local service providers and businesses with a direct and indirect financial benefit to the local community. It is likely that there will be direct employment for people living in the Study Area who may be qualified for construction related roles. Materials will also be sourced in the locality where possible. This is likely to cause a short-term, positive impact on the employment profile of the area.

The operation phase of the Coom Green Energy Park has potential to provide between 31 and 42 long term direct and indirect jobs. Only a small proportion of these jobs are likely to be directly based in the study area. It is therefore considered that the operational phase of the proposed development has potential for a slight positive indirect impact on employment in the study area. Rates and development contributions paid by the developer will contribute significant funds to Cork County Council which will be used to improve the services available to the people of the County. Business rates will also contribute significantly.

Local landowners will also benefit from lease agreements and wayleave agreements associated with the lands of the proposed development. Investment opportunities in the project also may economically benefit people living in the area with respect to the provisions of the forthcoming Renewable Energy Support Scheme. A Community Benefit Scheme will also be put in place to provide funding for community-led and community owned projects. Assuming that the proposed development will produce approximately 105 Megawatts and is contracted under the forthcoming Renewable Energy Support Scheme, it is anticipated that the community benefit fund could deliver over € 500,000 per year for the first 15 years following the commissioning of the project. This will provide a significant long-term economic benefit to the community in the area.

The potential impacts associated with the decommissioning phase in relation to socio-economics, employment and economic activity will be similar to those associated with the construction phase but of a reduced magnitude. There will be a slight, positive temporary impact to socio-economics, employment and economic activity in the study area associated with the employment of construction workers within the vicinity of the development during the decommissioning phase.

Given that the potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no other mitigation measures are considered necessary.

The residual impact of the development with respect to socio-economics is considered to be slight positive impact with respect to employment. This is as a result of the employment opportunities associated with the operation of the development.

The community benefit fund will provide a long-term significant positive impact to the study area and greater community, providing for social infrastructure, amenities and services, benefiting the community long after the decommissioning of the project. Long-term positive impact is also envisaged in that wind energy decreases the cost of electricity to the consumer.

11.3 Land Use

The proposed development site comprises predominantly agricultural lands and forestry. The proposed development covers an area of approximately 443ha.

Temporary disruption to agricultural and forestry lands is likely to occur during the construction phase. Slight, temporary impact to agricultural lands will occur during construction due to the small extent of infrastructure located on these lands. 62.8 hectares of coniferous forest is required to be felled to provide for infrastructure of the Coom Green Energy Park. This will result in a moderate, permanent impact to forestry in the area, if unmitigated.

Temporary effects on land use will arise as a result of the installation of the 110 kilovolt underground grid route connection which will be constructed partially on forestry lands, with the majority to be installed within the public road corridor. This may temporarily affect access to forestry and agricultural lands. This impact is likely to be slight, temporary.

The operational phase will result in the change of land use in areas where access tracks, wind turbine bases, hardstanding areas, substations, battery storage, borrow pits, and associated drainage works are required. The areas of the Coom Green Energy Park occupying agricultural land will have an insignificant impact on land use due to the small extent of development located on these lands. Farming practices can continue as usual during the operational phase. The 62.8 hectares of forestry that will be removed will be replanted at alternative sites. This will result in an imperceptible impact on forestry land use overall. The Bottlehill Landfill site is located adjacent the proposed CGEP. The proposed turbines and associated infrastructure avoids encroachment on the landfill facility. The design of the CGEP has ensured that the future permitted use of the site as a functioning landfill will not be negatively impacted.

The potential impacts associated with the decommissioning phase in relation to land use will be similar to those associated with construction phase but of a reduced magnitude. Temporary disruption to surrounding land uses are likely during decommissioning due to the presence of a construction crew. Removal of infrastructure from the site may temporarily impact on forestry practices during the decommissioning works.

The design of the project has provided for mitigation to avoid impact on land uses in the area. Construction and decommissioning works will be controlled by a detailed construction and environmental management plan. This will set out best practice methods to avoid impact on land uses in the area during these works. Replant lands are proposed to mitigate against the loss of forestry associated with the project.

Benefits to forestry practices as a result of the upgrading of access tracks throughout the site will cause a moderate, positive impact for forestry land use.

11.4 Recreation, Amenity and Tourism

There are no significant tourist attractions in the immediate area of the site. Recreation and amenity attractions in the area include a number of walking trails including Munster Vales, Ard An Rabhaidh / Ardarou trail, Killavullen Loop Trail and heritage sites including Glenville Holy Well and Island Wedge Tomb. It is considered that the main tourism and recreation potential for the area is trail walking and hiking.

The construction phase has potential to impact on recreation, amenity and tourism activities within the vicinity of the site. This will likely occur due to the closure of forestry trails at the site due to construction works. These trails are used by the locals as part of Coillte's Open Forest Policy. Closure of these tracks is expected to last the duration of the construction phase of 18-24 months. Therefore, a moderate, temporary impact to the sections of forestry trails associated with the Coom Green Energy Park site will occur due to closure during the construction phase. Transport and haul routes are proposed to direct construction related traffic to appropriate routes. These routes, as set out in the Traffic and Transportation Chapter, come in close proximity to the Ard An Rabhaidh / Ardarou trail, the Killavullen Loop, Castleblagh Trail and the Blackwater Valley Drive. Potential impact from increased traffic is expected to be insignificant and temporary at these recreation trails.

Due to the low magnitude of impact on the Blackwater Valley high value landscape, the lack of impact on local recorded monuments, the temporary impact on walking trails and the availability of other walking trails in the wider area, the Coom Green Energy Park is expected to have a temporary, non-significant impact on recreation and amenity in the area, maintaining the area's strengths in trail walking and hiking in the long-term.

The potential impacts associated with the decommissioning phase in relation to recreation, amenity and tourism will be similar to those associated with construction phase but of a reduced magnitude. It is expected that moderate temporary impact on recreational trail walking and hiking will occur due to the closure of trails during the decommissioning phase. Impact on nearby amenity trails as a result of the decommissioning phase of the Coom Green Energy Park is expected to be insignificant and temporary.

In designing the Coom Green Energy Park, careful consideration was given to the potential impact the proposed turbines may have on high value landscape located to the north of the Nagle Mountains along the Blackwater Valley. As such, the design removed major views of the development from this high value landscape, which includes designated scenic routes and tourism and heritage sites, in order to protect high value amenity.

It is expected that there will be no significant, adverse impacts to recreation, amenity and tourism in the surrounding area as a result of the Coom Green Energy Park.

11.5 Human Health

2016 Census Data indicates that the population of the study area is generally in good health with 91% of respondents stating they have good or very good health.

The construction works associated with the proposed development have potential to create health and safety hazards for both construction workers and the general public. Hazards may occur on site due to a range of construction activities. Potential health and safety hazards may occur on public roads and adjacent land uses including agricultural lands and forestry lands and associated recreation uses (forestry racks) due to construction activities. If unmitigated, hazards may be caused by the presence of a construction crew, increased traffic, presence of heavy goods vehicles and machinery, potential obstructions on the public road and potential obstruction to recreation and amenity trails.

At the time of preparation of this chapter, the COVID-19 virus represents a significant risk to human health. Similar to any construction site, potential for spread of the virus during the construction phase of the proposed development may occur due to potential transmission from worker to worker due to construction activities and potential for close quarter working conditions. Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken if COVID-19 remains a significant health issue during the construction phase.

No significant impacts on air quality have been identified with regard to the emissions of construction related traffic. The potential impacts from noise during the construction phase are expected to have a slight and temporary impact on nearby homes. Noise levels are not expected to exceed construction noise limits. A slope stability assessment was carried out which indicated that a landslide is unlikely to occur at the site as a result of construction work. Flood risk assessment has indicated that flooding will not occur at the site. There is potential for impact to water quality as a result of construction work which could impact on ground water abstraction if unmitigated.

Appropriate site safety measures will be used during the operational phase by all permitted employees. Wind turbines are equipped with a number of safety devices to ensure safe operation during their lifetime. This includes anti-vibration sensors which will detect ice build-up on a turbine and switch it off until the ice is removed. Shadow flicker detection systems will be put in place which will turn turbines off during the period in which shadow flicker may occur on a house. Battery storage unit will be subject to adequate measures and standards for fire detection and management to allow for detection of issues, control of temperatures, identification of potential fire risk and will house fire suppression systems. There is no likely impact to public safety or employee safety as a result of the proposed development provided that mitigation measures are in place. Improvement of walking trails throughout the site will result in a positive health gain with potential to provide a moderate positive impact to human health in the locality.

A literature review was carried out in relation to potential impacts of wind turbines on human health. It is concluded that there is no scientific consensus to support an association between negative health impacts and responsible wind turbine development. Therefore, provided that mitigation measures are implemented, the operation of the wind farm is expected to have a negligible impact on human health and safety.

The project was assessed in relation to its vulnerability to potential natural disasters. This included an assessment of flooding, fire, landslides and major incidents involving dangerous substances. It is concluded that it is unlikely that the proposed development will be impacted by natural disaster.

The potential impacts associated with decommissioning phase in relation to human health will be similar to those associated with construction phase. Potential impacts to human health and safety on-site will be prevented through best practice methods. If unmitigated, hazards to the public may be caused by the presence of a construction crew, increased traffic, presence of heavy goods vehicles and machinery, potential obstructions on the public road and potential obstruction to recreation and amenity trails. Potential impact to public health and safety during the decommissioning phase is non-significant and temporary, once mitigation measures and best practice site methods are followed

A Safety and Health Management Plan covering all aspects of the construction and decommissioning process will control site safety and other related issues. This plan will be prepared prior to construction and decommissioning and will include a traffic management plan. Best practice construction methods will be followed at all times. Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction and decommissioning stage. Appropriate signage will be utilised to raise awareness.

Access to electrical infrastructure will be prohibited during the operational phase. All personnel working on the site will be appropriately trained and will be equipped with the necessary protective equipment. Lightning conductors will be installed on each turbine and lights will be installed on each turbine as an aircraft safety precaution. Ice detection systems will be installed in each turbine to prevent turbines from rotating while ice is forming on a blade. A shadow flicker detection system will be installed on all turbines which will prevent shadow flicker from occurring at nearby homes. Noise control measures will be used in times of high winds to prevent excessive noise at nearby homes. Fire safety measures and equipment throughout the site will be kept in effective working order. Routine maintenance will take place.

Due to the significant setback distance, elimination of shadow flicker and noise control measures to reduce potential impacts on nearby homes as well as the mitigation measures set out throughout the EIAR, impact on human health as a result of the Coom Green Energy Park is expected to be imperceptible.

Long-term positive residual impacts will occur due to the provision of clean, renewable electricity. The operation of the Coom Green Energy Park will result in the net displacement of 137,371 tonnes of CO_2 per annum which would otherwise be emitted through the burning of fossil fuels

11.6 Renewable Resources, Non-Renewable Resources and Utility Infrastructure

There are a number of operational and disused quarries and pits in the vicinity of the site with Lyrevarrig Quarry being located in close proximity. It is proposed to haul construction materials from batching plants, quarries and pits within the vicinity of the proposed development. The quarries and pits within the vicinity of the proposed development provide sources of aggregates, hardcore, fill materials, washed sand and gravel, pebble sand aggregates and mortar. Ready mix concrete will be sourced from batching plants. In terms of other non-renewable resources within the site area, there is peat boglands located north of the western turbine cluster.

Renewable resources in the area includes extensive forestry plantations.

Construction will impact on a natural resources such as aggregates (sand, gravel, crushed stone) which will be sourced from quarries and pits in the area. It is expected that approximately 51,490m^3 of aggregate materiel will be brought to the site. A further 44,800m^3 of aggregate materiel will be taken from 3 borrow pits located at the site. This will result in a slight, permanent impact on non-renewable resources of the area.

62.8 hectares of commercial forestry will be felled to accommodate the proposed development. Impact on renewable timber resources will be imperceptible due to replanting of forestry at an alternative site.

The delivery of turbines may result in the temporary relocation of telephone poles due to oversail. This has the potential to cause a non-significant temporary impact on nearby dwellings and commercial/industrial activities. The construction of the cable trenches along public roads will have a slight, negative temporary impact on the roads concerned during construction, with some roads likely to require re-surfacing.

Once the Coom Green Energy Park is operational, the potential for negative effects on material assets is minimal. The direct effect of electricity generated by the proposed development will give rise to a reduction in the quantity of fossil fuels required for electricity generation across the State. This will give rise to a long-term positive impact and will contribute to reducing Ireland's dependency on imported fuel resources.

The two proposed substation buildings are expected be taken in charge of by Eirgrid or ESB which will have a positive impact on electricity infrastructure. There will be no significant impact on renewable and non-renewable sources during the decommissioning phase. No likely negative impacts on utility infrastructure are expected during the decommissioning phase.

Non-renewable resources of stone and fill will be sourced locally and will be excavated from on-site borrow pits insofar as possible to minimise transportation distances, reducing CO^2 emissions.

The 62.8 hectares of forestry which will be felled at the CGEP site will be replanted at alternative lands under a felling licence.

Existing services along the proposed cable route have been predicted through a desktop study and will be confirmed in the pre-construction surveys prior to construction. This will minimise the impact in terms of disruption or damage to existing utilities. Forestry removed from the site will be replanted at an alternative site.

The proposed development will result in a positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation. The two proposed substations are expected to be taken in charge of by Eirgrid or ESB following decommissioning, providing a positive residual impact on electricity infrastructure in the area.

12. SHADOW FLICKER

Under certain combinations of geographical position, wind direction, weather conditions and times of day and year, the sun may pass behind the rotors of a wind turbine and cast a shadow over the windows of nearby buildings. When the blades rotate and the shadow passes a window, to a person within that room the shadow appears to 'flick' on and off; this effect is known as 'shadow flicker'. The phenomenon occurs only within buildings where shadows are cast across a window opening, and the effects are typically considered up to a maximum distance of 10 times the rotor diameter from each wind turbine. At greater distances the effects are generally considered to be negligible.

A study area of 1,380m from each of the 22 wind turbines was selected for the shadow flicker assessment of the Coom Green Energy Park. This is based upon ten times the maximum rotor diameter of each turbine (138 m) that would be used within the proposed development, in accordance with current guidelines. The assessment considers all identified potential shadow flicker sensitive receptors within the study area. For this assessment, inhabited residential buildings and offices have been considered sensitive receptors.

The potential for shadow flicker to occur and the intensity and duration of any effects depend upon the following factors:

- the location and orientation of the window relative to the turbines;
- whether a window has direct, unobstructed line of sight to the turbine rotor;
- the distance of the building from the turbines;
- the turbine geometry;
- the time of year (which impacts the angle of the sun's path across the sky);
- the frequency of cloudless skies (particularly at low elevations above the horizon); and,
- the wind direction (which impacts on which direction the turbine faces).

A shadow flicker model was created using computer software. This calculates all the possible instances of shadow flicker throughout the year at all shadow flicker sensitive receptors (houses and offices) within the study area. This assumes that there are clear skies 100% of the time, all windows have unobstructed views of the turbines and all turbines are facing the window at all times. In reality shadow flicker will only occur some of the time, as turbines will not always be orientated as described, clouds will obscure the sun and line of sight may be obscured by trees or other obstacles. A correction factor is then applied to the theoretical occurrence figures which considers the average % of time per year that there are clear skies. We can then calculate the likely occurrence of shadow flicker.

In total, 115 properties have been identified within 10 rotor diameters (1,380m) of the turbines, and of these 95 have been identified as either dwellings or offices (or could not be ruled out as either) and are therefore considered potential shadow flicker receptors. This can be broken down into 93 residential receptors (4 of which are currently uninhabited) and 2 commercial properties.

The remaining 20 buildings have been classified as uninhabited, derelict or otherwise insensitive to shadow flicker; these have not been considered as part of the shadow flicker assessment. Occupied residential receptors do not occur within 750m of the proposed development.

Potential annual and daily impacts were calculated for each shadow flicker sensitive receptors within the study area. The assessment indicated that shadow flicker will occur at 72 of 95 of the buildings. Each of the 72 buildings have a varying amount of shadow flicker depending on its location. For each building, the times and dates when shadow flicker will occur have been calculated. Without mitigation, all 72 of the identified receptors would receive shadow flicker from time to time and 4 of the receptors identified would potentially receiving above the recommended yearly amount (30 hours per year).

However, it is possible to eliminate shadow flicker at all receptors within 10 rotor diameters by ensuring that the turbines do not operate during the times and conditions that shadow flicker may occur.

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines to prevent operation during periods when shadow flicker may occur to attain 'zero shadow flicker' in so far as possible. The calculated shadow flicker periods can be input into the turbine control software and when the correct conditions are met i.e. the light intensity is sufficient and during a potential period of shadow flicker, individual turbines will cease operation until the conditions for shadow flicker are no longer present. This method of mitigation will be used to mitigate all shadow flicker effects resulting in zero shadow flicker as far as possible.

The results of the shadow flicker assessment predict that the Coom Green Energy Park has the potential to introduce shadow flicker at 72 receptors. The implementation of mitigation to cease operation of the turbines during periods of potential shadow flicker will ensure that no shadow flicker effects are experienced in any sensitive receptor within 10 rotor diameters of a turbine.

A permitted turbine was identified at Moneygorm, approximately 1.2km south east of the site. This turbine has not been constructed; however, a cumulative assessment was conducted in order to identify potential in combination impacts. No sensitive receptors were found within the zone of influence of the permitted turbine. Therefore, it is concluded that the potential cumulative impact of shadow flicker is negligible when considering the potential impacts of the Coom Green Energy Park in combination with the permitted single wind turbine at Moneygorm.

13. TRAFFIC AND TRANSPORT

It is estimated that the construction of the development will take approximately 18-24 months.

The Coom Green Energy Park will be served by four site entrances. Two entrances are required to the west to access the Bottlehill and Mullenaboree areas of the proposed development. Two site entrances will be required to the east. One of these is required for access to the turbines and associated infrastructure in the Knockdoorty area and the other is required for access to construct the substation at Lackendarragh North.

The grid connection is proposed to route from the on-site substation at Knockacullata to the substation at Lackendarragh North and on to the substation at Barrymore near Castlelyons. The cable will follow the route along the local road and cross the M8 to Barrymore, the grid cable will cross private lands near Lackendarragh North substation and then follow the public road. C7.7km of the proposed 110kV cable associated with the grid connection will be laid in private lands and c16.7km will be laid within the public road.

In constructing the energy park, materials and plant will need to be delivered to the site. The material haul routes will include some of the surrounding road network and will need to cater for the additional traffic associated with the development.

Turbine deliveries will be from Ringaskiddy and will be delivered along two distinct routes. One route to the west of the site, servicing the Bottlehill and Mullenaboree parts of the site and a second route to the east, servicing the Knockdoorty part of the site. The port of entry is Ringaskiddy where the turbine components will be offloaded and transported to the site, via the N28 and the N40 to the Dunkettle Interchange.

At the Dunkettle Interchange, the components travelling to the west will take the N8 to Silversprings and then take the R635 (north ring road) around the north side of Cork City. At Blackpool, the components will join the N20 and turn off at the junction with the L-1217 towards Bottlehill Landfill. At this junction the components will travel north and enter the site at the existing Coillte site entrance off the L-1219-0.

In order to access the site via the existing Coillte entrance point on the L-1219-0, turbine delivery vehicles shall pass the final junction to the site entrance between the L-1217 and L-1219-0, turn at a temporary hard standing in Coillte land at Glashaboy South which is located approximately 2km south-east of the proposed site entrance and make their final approach to the site from the east and south. At the temporary turning area, wind turbine blade components shall be transferred via crane from standard extendable trailers to 'Superwing' blade lifting trailers which will allow them to negotiate the L-1217/L-1219-0 junction.

Components travelling to the east of the site will travel north at Dunkettle along the M8 motorway. At Junction 14 on the M8, the turbine components will exit the motorway and travel south into Fermoy. Once the turbines reach Fermoy, they will travel west along the N72 and turning south just east of Ballyhooley. From there they will follow local roads across the Blackwater River and to the site entrance at Lackendarragh North.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and temporary local road widening through the laying of compacted aggregate to verges. Any accommodation works will be carried out in advance of the turbine deliveries, following further consultation and agreement with the local authority.

The construction activities associated with the Coom Green Energy Park will lead to additional construction related traffic on the existing public road network over the duration of the construction works.

These impacts will include:

- Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.
- HGVs transporting conventional earthworks machinery such as excavators, dumper trucks and rollers.
- Fuel trucks transporting fuel for plant to each site compound during the construction phase
- Light Goods Vehicles (LGVs) such as cars, 4x4s and vans used by the workers and supervisory staff involved in the construction works.
- Oversized loads including turbine components.

The grid connection construction works will require a combination of temporary road closures with traffic diversions and temporary lane closures along the proposed route. The impact of the traffic diversions and lane closures on a section of road will depend on the location of the grid connection works and active traffic at the time of installation. The negative impact of the grid connection works is anticipated to be temporary and 'slight' to 'moderate' in significance without appropriate mitigation (i.e. traffic management).

The delivery of turbine components including blades, tower sections and nacelles is a specialist transport operation owing to the oversized loads involved. The blades are the longest component and have been considered for the purpose of this assessment. Turbine component deliveries will be carried out at night during off-peak times and will be done using a convoy and a specialist heavy haulage company. Turbine deliveries will also be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised. The impact of turbine deliveries will be temporary in duration and of slight significance.

It is estimated that the construction phase for the entire development will lead to 22,836 additional HGV trips (two-way) over the duration of the construction works. The combined HGV and LGV average daily increase is 113 trips per day.

The trip generation for the development once operational is anticipated to be minimal.

Negative or adverse effects on the receiving environment associated with decommissioning works at the energy park site are considered to be temporary in duration and not significant following mitigation.

Mitigation measures include the following:

- A Traffic Management Plan to be implemented
- A Traffic Management Coordinator to be appointed
- Road pre-condition survey to be carried out
- Road reinstatement on completion of the works
- Site inductions – all workers will receive an induction
- 24-hour emergency contact
- Traffic management guidance – all temporary traffic management will be planned and executed in accordance with best practice
- Letter drops will be carried out
- Signage – clear signage will be provided
- Road sweeper – if necessary a road sweeper will be used
- Site entrance – the entrance will be secured when not in use and when necessary a flagman will be used.

For the grid connection a road opening licence will be required. In advance of the works route proofing will be conducted. Local access will be maintained and measures will be taken to prevent soil/dirt on the road. Trenches will be backfilled and reinstated to the satisfaction of the roads authority.

Mitigation measures adopted for project decommissioning shall be in line with those identified for the construction phase of the development.

Negative or adverse effects on the receiving environment associated with the construction works within the main wind farm site are considered to be short-term in duration and slight in significance following mitigation.

Negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary and imperceptible following mitigation.

Negative or adverse effects on the receiving environment associated with the grid connection route are considered to be temporary and slight following mitigation.

The trip generation for the development once operational is anticipated to be minimal. Effects on the receiving environment associated with the operation phase of the development are considered to be neutral in terms of quality, long-term in duration and imperceptible in significance.

14. ARCHAEOLOGY, ARCHITECHTURAL AND CULTURAL HERITAGE

This chapter assesses the impacts of the proposed energy park, grid connection and turbine delivery routes on the known and potential cultural heritage resource within their environs. The term 'Cultural Heritage' encompasses heritage assets relevant to both the tangible resource (archaeology, architecture heritage); and non-tangible resources (history, folklore, tradition, language, place names etc.).

A study area extending for 1km from the proposed locations of turbines, access roads, compounds, borrow pits and substations within the energy park was reviewed in order to assess the potential for direct impacts on the cultural heritage resource. The wider landscape surrounding the proposed energy park was also reviewed to assess the potential for indirect impacts on National Monuments and other extant recorded monuments with potential visual alignments across the landscape, including megalithic tombs, stone circles and stone rows. There is one National Monument located within this study area and this comprises Island wedge tomb (Nat. Mon. ref. 502; RMP CO042-056001-) which is 2.3km to the west of the proposed energy park. The grid connection and turbine delivery routes along the existing public road network were also assessed as were the locations of proposed tree replant areas.

There are no recorded archaeological sites located on the footprint of any element of the proposed energy park while there are seven examples ranging from the late prehistoric to post-medieval periods located within the surrounding 1km study area. There are no designated architectural heritage structures located within this area.

There are five recorded late prehistoric monuments located within 1km of the proposed energy park.

A review of the wider landscape revealed that Island wedge tomb is located approx. 2.3km to the west of the proposed energy park and is a National Monument in State Guardianship (National Monument ref. 502; RMP CO042-056001-). The recorded extent of the Claidh Dubh road (CO018-001----) terminates approx. 2.1km to the north of the nearest element of the proposed energy park. This road is of potential Iron Age date and follows a meandering course between the Nagle and Ballyhoura Mountains. There are also a number of stone cairns of potential prehistoric date located in forested hills further to the north and northwest and none of these are located within 1km of the proposed energy park. The presence of extensive forestry plantations has obscured the inaccessible cairn locations, and none are visible from any area of the proposed energy park.

There are no recorded early medieval sites located within 1km of the proposed energy park although the potential exists that a roadside holy well (CO042-081----) located 1.1km to the southwest may be associated with early ecclesiastical activity within the general area.

A levelled enclosure (CO043-003----) within a field located 540m to the northwest of the proposed energy park is depicted as a rectangular feature on the 6-inch OS map and its layout suggests it may potentially be the remains of a medieval moated site, which were fortified residences/farmsteads often built by Anglo-Norman settlers in the late 13th/early 14th centuries.

The recorded location of a possible single burial (CO042-082----) of potential post-medieval date is within an forested area 580m to the southwest of a proposed temporary compound.

There are no recorded archaeological sites, designated architectural heritage structures or Architectural Conservation Areas located on the public road network that forms the grid connection to the existing Barrymore substation located *c.*4km to the southeast of Fermoy town.

There is one recorded existing archaeological site located within the 100m wide study area corridor centred on the route and this comprises a levelled enclosure site (CO035-042----) in Glanakip townland which is located within a forestry plantation 30m to the east of the road. There are a number of masonry road bridges over watercourses along the grid route and none of these are listed in the RPS or NIAH for County Cork.

There are two proposed delivery routes to the proposed energy park from Ringaskiddy and neither will entail the construction of new roads or require interventions to any archaeological sites or architectural heritage structures. A review of the locations of minor road works and a turning area to the south of the energy park revealed that there are no recorded archaeological sites or architectural heritage structures within 100m of these areas.

Field surveys confirm that there were no traces of potential archaeological features, unrecorded built structures, pre-forestry field boundaries or trackways noted during the visual inspections of accessible areas of the plantations. The River Bride and a number of its small tributary streams flow in a generally southerly direction within low-lying lands located between proposed energy park development areas and no construction works or new crossings are proposed within these watercourses. There are no wide watercourses located within the environs of proposed energy park work areas and where narrow, shallow streamlets were noted within the forestry plantations they have been collected into modern earth-cut drains and are carried under the existing forest roads by modern pipe culverts.

There is one existing recorded archaeological site located within the 100m wide corridor centred on the grid connection and this comprises a levelled enclosure (CO035-042----) within a forestry plantation in Glanakip townland. Its recorded location is 30m to the east of the road and no visible surface traces of the enclosure were observed during the inspection. There were also no potential unrecorded archaeological sites noted during the inspection of the road margins along the route.

The construction phase will result in no predicted direct or indirect impacts on the known cultural heritage resource.

The operation phase of the proposed development will result in no predicted direct impacts on the known cultural heritage resource.

There is only one recorded archaeological site within 1km of the proposed energy park which retains any surviving surface expression (Barrow CO043-004----). This comprises a barrow site (CO043-004----) located within a pasture field located 240m outside the proposed energy park. This site is surrounded by forestry which screens its location and no indirect impacts on its setting are predicted during the operational phase.

There is one National Monument in State Guardianship (Island wedge tomb) located within this area, at a distance of 2.3km to the west of Turbine 2. The alignment of this monument (NE-SW) will not be impinged upon by the proposed energy park. The monument comprises a low stone-built structure (*c.*0.8m high) located within a pasture field in a private farm property and is infrequently visited. A visual analysis assessment of this this monument was carried out in combination with the Landscape and Visual Impact Assessment consultant. A review of photomontages from its location determined that the blade set of one turbine and the partial and filtered view of blades from two further turbines will be visible through a gap in foreground vegetation to the east. The magnitude of visual impact on the monument's setting created by the blades located 2.3km to the east is deemed to be low and with a predicted slight, long term, negative significance of visual impact.

The assessment of visual impacts undertaken by the Landscape and Visual Impact Assessment consultant within the wider 20km area included cultural heritage receptors accessible to the public which are identified in Chapter 15.

The assessment of the sensitivities and impacts on the cultural heritage receptors presented in that chapter were determined in consultation with the Archaeologist. No significant operational phase visual impacts on these cultural heritage receptors were identified.

The grid connection will comprise a buried cable within the existing road network and will result in no predicted direct or indirect impacts on the cultural heritage resource during the operational phase.

No impacts relating to the turbine delivery route will arise during the operational phase.

A review of a number of developments was undertaken in order to assess the potential for cumulative impacts on the cultural heritage resource. These included proposed replacement tree replant lands, the Cork County Council landfill site, surrounding forestry plantations and an approved single wind turbine within the environs of the north end of the proposed energy park. The proposed development will not result in any predicted cumulative impacts on the cultural heritage resource in combination with these developments.

A systematic advance programme of archaeological site inspections will be undertaken within all development areas following pre-construction tree felling and this will be followed by monitoring of ground excavation works during the construction phase under licence by the National Monument Service. In the event that any previously unrecorded archaeological sites are identified they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation by avoidance or preservation by record through a systematic archaeological excavation.

A programme of licensed archaeological monitoring of all ground excavation works within the section of road to the west of the recorded location of the levelled Enclosure (CO035-042----) in Glanakip townland will be carried out during the construction phase. Trenching works within the road material over masonry bridges along the route will also be subject to archaeological supervision. An archaeological watching brief of ground excavation works will be maintained for the remainder of the grid connection works.

The delivery of turbines to the proposed energy park will require localised widening works in green field road margins that will include ground excavations that may reveal unrecorded, sub-surface archaeological features and works in such locations will be subject to licensed archaeological monitoring.

The mitigation measures presented above will provide for either the avoidance of the unrecorded archaeological resource or the proper and adequate recording of this resource. The grid connection and turbine delivery routes will not result in any residual impacts on the cultural heritage resource. The proposed energy park will result in a slight, indirect, long term, negative residual impact on Island wedge tomb, a National Monument in State Guardianship located 2.3km to the west of the nearest element of the energy park. It will also result in slight to moderate, negative residual visual impacts on a number of cultural heritage receptors within the wider landscape .

No residual impacts on the architectural heritage and undesignated cultural heritage resources are predicted to arise following decommissioning of the energy park. No residual impacts on the architectural heritage and undesignated cultural heritage resources are predicted to arise from the grid connection route or turbine delivery route at any stage of the development.

15. LANDSCAPE AND VISUAL

The Landscape chapter describes the landscape context of the proposed Coom Green Energy Park and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

The proposed development spans the southern and southwestern extents of the Nagle Mountains, south of the Blackwater River Valley. Both the Nagle Mountains and the Blackwater River valley are the most prominent landscape features within the Central Study Area and its wider surrounds. North of the proposed development, the Nagle Mountains rapidly descend into the valley of the River Blackwater, which is oriented in an east-west direction and creates a distinct division in the landscape in the northern half of the Study Area. South of the Nagle Mountains, the terrain transitions to that of a landscape of rolling hills punctuated by a number of small river valleys. A number of other distinctive landscape features also occur within the Wider Study Area and include the Boggeragh Mountains which are situated along the eastern periphery of the Study Area. The foothills of the Ballyhoura Mountains also pierce the northern periphery of the Study Area whilst several rivers and streams emanate from the uplands within the Ballyhoura Mountains and flow through the northern portions of the Study Area.

Whilst a large portion of the Central Study Area is occupied by commercial forestry plantations, the most prominent land use within the Study Area is that of agricultural farmland. The site itself is situated within rolling terrain cloaked in commercial conifer plantations that are encircled by productive agricultural farmland defined by hedgerows and tree lines. The proposed Bottle Hill turbine cluster is located around the landfill site, which itself is surrounded by commercial conifer plantations. Smaller blocks of commercial forestry plantations are also found in the wider environs of the Study Area and often relate to the elevated portions of rolling hill or ridges.

The most notable transport route within the Study Area is that of the M8 motorway which traverses the entire eastern half of the Study Area. The N20 is situated just under 4km to the west of the site at its nearest point whilst to north, the N72 national secondary route runs in a general east-west direction just under 5km from the nearest turbine at its nearest point. The N73 national secondary route diverges from the N72 northeast of Mallow and is situated just under 10km from the site at its closest point. A dense network of national primary and secondary routes and regional roads pass through Cork City on the southernmost periphery of the Study Area. A section of national railway line passes through the western and southern parts of the Study Area in addition to the Dublin – Cork line, which passes through the western extents of the Study Area.

In terms of amenity and heritage features, the Blackwater Way (Avondhu) national waymarked trail is a 94km walking trail that follows the course of the River Blackwater and is situated just under 4km north of the proposed turbines at its nearest point. The Killavullen looped walk intersects the Blackwater Way south of Killavullen and passes just over 1.5km northwest of the nearest turbine at its nearest point. Doneraile Wildlife Park is a 166 hectare landscape park, which is situated in the settlement of Doneraile just under 15km north of the proposed development.

Originally dating from before 1200, Blarney Castle and gardens is a popular international tourist attraction in the picturesque settlement of Blarney northwest of Cork City. The castle is open to the public and is situated 14km southwest of the nearest proposed turbine. Visitors make their way to the ramparts of the castle where they can take in views of the surrounding landscape and Blarney Village before kissing the famed ‘Blarney Stone’.

In terms of the Cork County Landscape Character Assessment, the proposed development is shown to be situated within the northwest corner of the Landscape Character Type LCT 13b – 'Valleyed Marginal Middleground' which is recognised as having; 'Medium' landscape sensitivity; 'Medium' Landscape Value; and 'Local' Landscape Importance. The westernmost portions of the proposed development lie adjacent to LCT 10b – Fissured Fertile Middleground whilst the northernmost areas of the proposed development are situated immediately adjacent to the boundary of LCT 5 - Fertile Plain with Moorland Ridge. LCT 10b is recognised as having; 'Medium' landscape sensitivity; 'Low' Landscape Value; and 'County' Landscape Importance, whereas LCT 5, associated with the Blackwater Valley, is assigned 'Very High' landscape sensitivity; 'Very High' Landscape Value; and 'County' Landscape Importance. As a separate designation, the County Development Plan also identifies 'High Value Landscapes' (HVL). Whilst the proposed development is not situated in an area recognised as 'High Value Landscape', the landscape immediately north of the site that falls within LCT 5 – Fertile Plain and Moorland Ridge is within a HVL designation. In relation to the Cork Wind Energy Strategy the site is contained in an area that is 'Open to Consideration', whereas the HVL landscape to the north is identified as an area where wind energy development is 'Normally Discouraged'.

In terms of scenic designations, the Cork County Development Plan contains well over 100 designated 'Scenic Routes', with 21 of these falling within the 20km radius study area. Due to proximity and potential visual exposure of the proposed development, the most relevant scenic routes are considered to be 'S11' and 'S12', which lie to the northwest and west of the site respectively.

Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site measures as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases. In this instance, the two main forms of landscape and visual mitigation employed were; mitigation by avoidance and design, and; residential buffering.

During the early design stages of the proposed Coom Green Energy Park, key landscape and visual constraints were identified. In terms of macro level design consideration, the most sensitive of these were deemed to be the Black Water Valley, for reasons of both landscape character and scenic designations as well as Blarney Castle and associated demesne because of its tourism, heritage and amenity value. Reverse Zone of Theoretical Visibility (ZTV) maps were prepared from several scenic designations within the Blackwater Valley and the top of Blarney Castle. Reverse ZTV maps can identify areas within the site in which turbines can be placed so as not to be visible from a particular location, or visible to a minimal degree. The design of the proposed wind farm was notably influenced by the early stage Reverse ZTV exercise undertaken in respect of these sensitive receptors.

For the proposed Coom Green Energy Park, the minimum distance of any turbine from the nearest residential receptor is 750m, which is in excess of the current Wind Energy Development Guidelines (2006) recommended distance of 500m. It is also in excess of the recently published Draft Revised Wind Energy Guidelines (2019), which indicates a 4 X tip height buffer distance; up to 676m distance from residential receptors in this instance.

The physical landscape as well as the character of the proposed development and its immediate surrounds is affected by the proposed turbines as well as ancillary development such as access and circulation roads, areas of hard standing for the turbines, borrow pits, grid connection and the substation. By contrast, for the wider landscape of the Study Area, landscape impacts relate to the influence of the proposed turbines on landscape character. Construction, operational and decommissioning phases of all aspects of the development are considered in the landscape impact assessment.

There will be physical impacts on the land cover of the site as a result of this development, but these will be modest and dispersed in the context of the already modified conifer forest plantations that typically cover the site.

Furthermore, a high proportion of the existing track network from forest plantations will be utilised in the construction and operational phases of the development.

Overall, it is not considered that the proposed wind farm will give rise to significant landscape impacts. Instead, the significance of landscape impacts is considered to be Moderate-slight within the central study area (<5km). Thereafter, significance will reduce to Slight and Imperceptible at increasing distances as the development becomes a progressively smaller component of the wider landscape fabric.

The visual impacts of the proposed development were assessed across 42 different viewpoints where the sensitivity of each receptor varied widely from Low to High. The higher levels of sensitivity often related to elevated views from the uplands, which afford vast panoramas over the landscape or alternatively, represent outdoor recreationalists and tourists for whom views of the landscape are an important amenity consideration. Medium and Medium-low sensitivity tends to be attributed to more typical rural views that contain a varied mix of anthropogenic land uses, whilst Low sensitivity generally relates to busy settlements or road corridors where visual amenity is not a key consideration of receptors.

The significance of visual impacts for the 'Centre of Population', 'Major route' and 'Amenity and Heritage Feature' receptor sets are generally in the mid to low range. Only in respect of 'Designated Scenic Routes' and the 'Local Community' receptor set are impacts considered to be slightly higher, but not significant.

The most pertinent scenic route designations in this instance are those identified as S11 and S12 in the Cork County Development Plan because they occur in close proximity to the proposed development. The S12 scenic route is not considered to be significantly impacted by the proposed development as the main aspect of visual amenity, being elevated long distance views over rolling countryside, occurs in the opposite direction (west) to the proposed development, which lies immediately uphill to the east where it is substantially screened by forestry. Similarly, the Glannasack turbine cluster is uphill and peripheral to the main viewing direction from scenic route S11, which is down-valley to the southeast. Whilst the Bottlehill cluster of turbines is a prominent feature of the near-middle distance cross-valley views from this scenic route, rather than foreshortening or enclosing the view, they serve to frame the main aspect and complement the sense of space and distance of the overall vista - a vista that is considered to be valued more for its vastness rather than any sense of the naturalistic or the presence of striking or noteworthy landscape features.

A range of viewpoints were also selected to represent the local community. These are the people who live, work and move around the area within approximately 5km of the site (the central study area) and are the people most likely to have their visual amenity affected by a wind energy proposal due to their proximity to the turbines. In total, 17 of the 42 viewpoints are contained within 5km of the site where they represent the views of local residents, often in combination with other receptor types. Ten of these views were specifically selected to represent local community views and for these the highest significance of impact is deemed to be 'Moderate' at four locations (VRP9, VRP12, VRP15 and VRP17) whilst the remainder are considered to range between 'Moderate-slight' and 'Slight Imperceptible' significance.

In terms of cumulative wind energy developments, there is one other existing wind farm within the 20km radius Study Area and this is approximately 15km to the west (Esk Wind farm – 12 turbines). There are also some substantial scale existing wind farms outside of the Study Area to the west within the Boggeragh range (Boggeragh Wind Farm c. 23km west), to the north within the Ballyhoura range (Castlepook Wind farm 22km north) and the east in the Knockmealdown range (Barranafaddock Wind farm 23km east). Principally due to the separation distances involved to the nearest wind farm developments, cumulative landscape and visual impacts are not considered to be significant in this instance. Instead, the cumulative impact is judged to be Low-negligible.

16. TELECOMMUNICATIONS AND AVIATION

16.1 Telecommunications

Consultation regarding the potential for electromagnetic interference from the proposed development was carried out with the relevant national and regional broadcasters, fixed line and mobile telephone operators and other operators.

This consultation has confirmed that no turbines are proposed within the areas requested to be left clear of turbines. It also found that while there is existing telecommunications infrastructure within the proposed development, there is sufficient buffering distance between the nearest turbine and the location of this infrastructure in all instances.

According to the Comreg siteviewer[1], the nearest telecommunication masts are located in the townland of Forgestown where 5 no. masts are located, approximately 3km northwest of the proposed development. There are 2 no. masts located in the townland of Killasseragh, approximately 3km southeast of the proposed development. One telecommunications operator, Novatel, has indicated that there will be a small percentile of customers that will be affected particularly south facing. Mitigation measures put in place during construction will ensure broadband service is not interrupted. There will be no significant effect on all other telecommunication operations due to the proposed development.

Sections 5.10 of the Department of Environment Heritage and Local Government (DoEHLG) Planning Guidelines on Wind Energy Developments (2006) acknowledge that "electromagnetic interference can be overcome." There are a number of mitigation options that can be explored to overcome any residual impacts. The following link mitigation measures will be implemented as necessary to overcome electromagnetic interference:

- **Technology Upgrade:** Replacement of the existing telecommunications service equipment with another less affected type
- **Diverting telecommunications links -** The possibility of diverting telecommunication links to another telecommunications tower in the vicinity can be investigated.
- **Special Purpose Mitigation Tower -** the possibility of diverting the existing links and consolidating the existing towers to one tower can be explored.
- **Relocation of telecommunications equipment -** The possibility of moving telecommunication equipment to another telecommunications tower in the vicinity can be investigated.
- **Wind Turbine Tower –** To mitigate interference the turbine tower could be utilised as a transmitter/receiver (hop point).
- **Combination –** The possibility of providing a mix of the above or an alternative could be explored.

Consultation with RTE indicates that there will be no impact to any of their microwave telecoms links but there is potential of interference with TV reception. Mitigation of this potential interference could require some remedial measures in relation to television reception. In practice, such measures are not difficult to implement, are relatively inexpensive and if necessary will be undertaken by the developer in conjunction with 2rn/RTÉ.

[1] Comreg Siteviewer. https://siteviewer.comreg.ie/#explore

A 2rn Protocol Agreement has been signed by the applicant and 2rn in relation to interference on viewers television sets and broadcast radio receivers. This protocol has been included in Appendix 16.2 of the main EIAR. .

16.2 Aviation

The potential effects of wind turbines on aviation interests have been widely publicised. There are two dominant scenarios:

- Physical Obstruction: turbines can present a physical obstruction at, or close to, an aerodrome or other aviation activity site; and
- Radar/Air Traffic Services: turbine induced clutter appearing on a radar display can affect the safe provision of air traffic services as it can mask an unidentified aircraft from the air traffic controller and /or prevent the controller from accurately identifying aircraft under his control. In some cases, radar reflections can affect the performance of the radar itself.

The proposed development is 27 kilometres from Cork Airport and beyond its physical safeguarding Obstacle Limitation Surfaces (OLS) which extend 15 kilometres from the airport. The development does not therefore present a physical safeguarding risk.

The Irish Aviation Authority (IAA) indicated that the proposed development will not affect Instrumental Flight Procedures .

The aircraft altitude (or height) has no impact on the horizontal separation between wind turbine and aircraft. Similarly the wind turbine altitude (or height) has no impact on horizontal separation.

In this analysis only the horizontal clearance between aircraft and the turbines has been considered as a worst case scenario. This means that the results of this analysis apply for aircraft flying at any altitude profile on the specified horizontal trajectory. Similarly the results apply for any turbine height.

A software tool has been used to calculate the minimum horizontal separation between each specific (horizontally defined) trajectory and the nearest wind turbine or permanent meteorological masts.

The horizontal clearance between aircraft flying the test trajectories and the turbines is more than seven times the minimum horizontal clearance distance of 150 metres applicable for VFR flights in Ireland. The proposed turbines will therefore not affect aircraft flying ILS test trajectories and will therefore not have a significant impact on ILS test flights.

Aircraft using Cork Airport are controlled by radar. The minimum actual vertical clearance of 1,216 feet exceeds the minimum required clearance of 984 feet by 232 feet. The proposed turbines will therefore not adversely affect aircraft flying under radar control.

In line with standard practice with wind farm developments (in accordance with Air Corps policy on tall structures), the coordinates and elevations for built turbines will be supplied to the IAA and DAA. No other mitigation measures are required.

Whilst the proposed development will not impede aircraft flying the test trajectories it would nevertheless be prudent to ensure that pilots of test aircraft are fully aware of the presence of wind turbines, and any associated anemometry masts, before undertaking any test flights. The following mitigation measures are therefore recommended:

- All turbines and meteorological masts having a height of 100m or more are promulgated in the Irish Air Navigation Obstacle database
- The extremities of the wind farm are lit
- Meteorological masts are lit
- Locations of meteorological masts having a height of less than 100m are promulgated to the pilots of test aircraft
- Test aircraft are fitted with Terrain Awareness and Warning System (TAWS)
- Test aircraft TAWS obstacle databases are regularly updated

Due to the low risk of impacts associated with aviation, the residual impact is deemed to be not significant following the full implementation of mitigation measures including IAA and Department of Defence requirements.

17. INTERACTIONS OF THE FOREGOING

This Chapter considers the potential for interactions and inter-relationships between one aspect of the environment and another which can result in an impact being either positive or negative, as well as having varying levels of significance. The chapter considers potential significant environmental effects that may occur in terms of Air Quality & Climate, Noise & Vibration, Biodiversity, Land, Soils & Geology, Hydrology & Water Quality, Population & Human Health, Material Assets, Shadow Flicker, Traffic & Transportation, Archaeology, Architectural & Cultural heritage, Landscape & Visuals and Telecommunications & Aviation, as a result of the proposed project as described in Chapter 3 of this EIAR.

Direct, indirect, cumulative, and interactive impacts were considered during the siting of the proposed turbines and associated infrastructure in order to minimise impacts on the environmental aspects mentioned above. The interactions and inter-relationships of the potential impacts as set out throughout this EIAR are detailed in this Chapter.

Each individual chapter of the EIAR has had regard to interactions between different potential impacts. For example, Hydrology & Water Quality has had regard to potential impacts on Biodiversity; and Land, Soils and Geology has had regard to potential impacts on both Biodiversity, Hydrology & Water Quality and Traffic & Transportation.

The CGEP project has potential to impact on various environmental aspects as detailed throughout the EIAR. There are interactions and inter-relationships between these aspects. The EIAR has considered these interactions and inter-relationships throughout the assessment, firstly through the design wind farm site, grid route and turbine delivery route, to avoid impacts where possible and also in the definition of suitable mitigation measures to minimise potential impacts. It is therefore considered that the significant impacts associated with the interactions of environmental effects outlined in this chapter will be avoided due to the implementation of mitigation measures as detailed throughout the EIAR.

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