INCHAMORE WIND FARM

CO. CORK

VOLUME II

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

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1 INTRODUCTION

1.1 INTRODUCTION

This Chapter of the Environmental Impact Assessment Report (EIAR) introduces the proposed Inchamore Wind Farm (the Development) and provides details of the Environmental Impact Assessment (EIA), Project Team and the structure of the report. It sets out the broad context and defines the key terms of reference used in the environmental assessment of the Development. The Development is subject to an EIA, under the EIA Directive 2011/92/EU (EIA Directive) as amended by Directive 2014/52/EU.

The EIAR has been prepared by Jennings O'Donovan & Partners Limited, on behalf of Inchamore Wind DAC, to accompany a planning application for the Development. This EIAR takes into account the Project as a whole, including all integral elements that are not part of the Development, and all direct and indirect effects, and cumulative impacts and interactions.

In addition to the identification, description and assessment of the Development, this EIAR identifies, describes and assesses the overall Project (**Table 1.1**). Existing, permitted and known proposed developments and projects are cumulatively assessed in the EIAR. This includes projects and developments that are pending a decision from the planning authority and other known projects which are in the advanced stages of being prepared to be submitted for planning and have the potential for in combination effects, namely the Cummeennabuddoge Wind Farm[1]. Cummeennabuddoge Wind Farm is at the pre-planning/concept stage and is being prepared by the same client as Inchamore Wind Farm.

This EIAR includes the conclusions of the competent and qualified experts as to the significance of any environmental effects, to assist the competent authority to comply with Article 8a of the EIA Directive as amended.

Article 8a of the Directive specifies various requirements in relation to the making of the decision. These mainly relate to reasoned conclusion, conditions, mitigation measures and monitoring. The planning application is also accompanied by a Natura Impact Statement (NIS) as required under Article 6(3) of the EU Habitats Directive (92/43/EEC). This is an assessment of the likely or possible significant effects of the Development on sites designated as Natura 2000 conservation areas, also defined in Irish legislation as "European sites".

[1] https://cummeennabuddogewindfarm.ie/

This chapter is supported by Figures and the following Appendices in Volume IV:

- **Appendix 1.1:** Consultation Responses
- **Appendix 1.2:** Glossary of Common Acronyms
- **Appendix 1.3:** Community Consultation Report

1.2 KEY DEFINED TERMS

To provide clarity in the EIAR, the following defined terms will be used throughout.

Table 1.1: Defined Terms used throughout the EIAR

Term	Definition
Site	Refers to all land that falls within the Proposed Inchamore Wind Farm Redline Boundary as shown on **Figure 1.1**.
Redline Boundary	Refers to the proposed development redline planning boundary. It is the boundary line of all works to be completed as part of the Development and is shown on the planning drawings accompanying this EIAR.
Baseline	Refers to the existing lands and their characteristics.
Development	Refers to all elements of works described in the planning application form and public notices for Inchamore Wind Farm, the details of which are set out within **Chapter 2: Project Description**. These elements include the wind turbines, all site infrastructure and all works required on nodes of the Turbine Delivery Route that are within the Redline Boundary. They do not include the Grid Connection Route from the onsite substation to Ballyvouskill 220 kV substation.
Project	Refers to the Development and all associated infrastructure required for the wind farm to be functional, such as the Turbine Delivery Route and the Grid Connection Route.
Survey Areas	Refers to areas within which surveys are undertaken. These are specifically defined within each technical section/chapter of this EIAR.
Study Areas	Refers to areas which are considered as part of the assessment process. These are specific and defined within each technical section/ chapter of this EIAR.
The Council	Refers to Cork County Council.
Developer	Inchamore Wind Designated Activity Company (DAC)

Term	Definition
EIA Regulations	The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) transpose the requirements of the 2014 EIA Directive into the Planning and Development Regulations 2001 (As Amended).
EIA Directive	Refers to the EIA Directive 2011/92/EU.
The 2014 EIA Directive	Refers to EIA Directive 2014/52/EU which amends the EIA Directive.
Scoping	This is the process to identify key environmental issues, and to determine which elements of the Project are likely to cause significant environmental impacts and to identify elements that can be removed from the assessment.
The Onsite Substation and Control Building	Refers to the onsite substation comprising the control building and other associated electrical infrastructure, including the compound in which it is located.
Met Mast	Refers to the proposed Meteorological Mast to be located on site.
Replant Lands	Refers to offsite forestry replanting lands.
Construction Haul Routes	Refers to the proposed routes from local quarries and suppliers to the Site for construction materials.
Turbine Delivery Route	Refers to the proposed turbine delivery route from Ringaskiddy Port to the site entrance on the N22.
Grid Connection Route	Refers to the proposed route of connecting to the national grid.
Wind Farm Internal Cabling	Refers to the electrical cables connecting the turbines to the on-site substation.
Temporary Construction Compound	Refers to the compound to be developed and used by the appointed contractor(s) for the purposes of constructing the wind farm.
Turbine Hardstand	Refers to the hardstand next to the turbine location used by cranes for erection of turbine hub, nacelles and rotor blades.
Turbine Foundation	Refers to turbine concrete base located under ground level and used to support the turbine.
Decommissioning	Refers to the end of the operational life of the wind farm when turbines are dismantled and taken off site for recycling. The turbine

Term	Definition
	foundations, hardstands and the site roads will be left *in-situ* and allowed to revegetate through natural succession. The underground cabling will be removed while the ducting will remain *in-situ*. The substation building will be left *in-situ*.
Reinstatement	Reinstatement means restoring the habitat in the areas of the Site where infrastructure was developed.
Turbine Range	Refers to the range of turbine parameters assessed in this EIAR as per section 1.9.4.

1.3 THE APPLICANT

The Applicant seeking planning permission is Inchamore Wind DAC, a joint venture between FuturEnergy Ireland and SSE Renewables.

FuturEnergy Ireland (FEI) is the recently launched joint venture company owned on a 50:50 basis by Coillte and ESB. This new business combines the State's strongest assets and expertise in onshore renewable energy development on behalf of the people of Ireland. We are one of the largest dedicated developers of onshore wind in Ireland and our mission is to maximise the potential of our national resources and accelerate Ireland's transformation to a low carbon energy economy.

The aim of FEI is to help Ireland deliver on its green energy targets, achieving net zero emissions by 2050, as set out in the Government's Climate Action Plan and legislated for under the Climate Action and Low Carbon Development (Amendment) Act 2021. In this regard, FEI is looking to actively drive Ireland's transition to a low carbon economy by developing 1 GW of wind energy projects by 2030.

FEI is dedicated to developing best-in-class, commercially successful wind farms while maximising the support from local communities. Its wind farm projects have the potential to play a fundamental role in a green economy by creating jobs in rural areas and growing a green industrial sector, while also funding local development for host communities through its community benefit funds.

SSE Renewables is a leading developer, owner and operator of renewable energy in Ireland with a vision to make renewable energy the foundation of a zero-carbon world. The renewable electricity generated at wind farms operated by SSE Renewables across Ireland

powers SSE Airtricity, Ireland's largest provider of 100% green energy. The company's onshore portfolio in Ireland comprises 29 windfarms producing nearly 700 MW of renewable generation, including Ireland's largest wind farm the 174 MW Galway Wind Park.

1.4 THE SITE

The Site, as defined in **Table 1**, comprises an area of 167 hectares, of which a significant area is commercial forest owned by Coillte and the remaining third-party land is agricultural land of varied productivity and open mountain heath. The Site is located 5.9 km west of Ballyvourney, Co. Cork and shares the county boundary between Cork and Kerry. It is 54 km west of Cork City, and 23 km north-east of Kenmare, Co. Kerry.

The Site elevations range from 460 m AOD in the north-western side of the Site to 350 m AOD towards the eastern side of the Site. A Site Location Map showing the Redline Boundary is appended as **Figure 1.1** and a map which comprises all elements of the Project is outlined as **Figure 1.2.**

The Site is located in a rural setting and housing density in the area is low. There are 39 dwellings within a 2 km radius of the proposed turbines, comprising one off houses and farm holdings (**Figure 1.3**). The nearest settlements are Inchamore which is situated 750 m to the south of the Site Boundary, and the townland of Milleeny is located 1 km to the south-east of the Site Boundary.

The Development is located within the townlands of Inchamore, Mileeny Derryreag and Derreenaling.

A full description of the Development is provided in **Chapter 2: Project Description**.

1.5 SUMMARY OF PROJECT DESCRIPTION

Permission is being sought by the Developer for the construction of 5 No. Wind Turbines, a meteorological mast, an on-site substation, Turbine Delivery Route and all ancillary works.

The development will consist of

- A wind farm with an operational lifespan of 35 years (from the date of commissioning of the development).
- The construction of five turbines with an overall ground to blade tip height ranging from 177 m to 185 m inclusive; a rotor diameter ranging from 149 m to 155 m inclusive; and a hub height ranging from 102.5 m to 110.5 m inclusive.

- Construction of permanent turbine hardstands and turbine foundations.
- Construction of one temporary construction compound with associated temporary site offices, parking areas and security fencing.
- Installation of a (35-year life cycle) meteorological mast with a height of 110 m and a 4 m lightning pole on top, such that the overall structure height will be 114 m.
- Development of one on-site borrow pit.
- Construction of new permanent internal site access roads and upgrade of existing internal site access roads to include passing bays and all associated drainage infrastructure.
- Development of a permanent internal site drainage network and sediment control systems.
- Construction of a permanent 38 kV electrical substation including a control building with welfare facilities, all associated electrical plant and equipment, parking, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works.
- All associated underground electrical and communications cabling connecting the wind turbines to the on-site wind farm substation.
- Ancillary forestry felling to facilitate construction of the Development.
- All associated site development works including berms, landscaping, and soil excavation.
- Upgrade of existing forest access roads to include passing bays and all associated drainage infrastructure.
- Upgrade works on the Turbine Delivery Route to include the following:
    - Works at an entrance to an existing forest road accessed off the N22 to include localised widening of the forest road and creation of a splayed entrance, removal of existing vegetation for visibility splays and removal of street furniture to facilitate construction traffic including the delivery of abnormal loads and turbine component deliveries.

A 10-year planning permission and 35-year operational life for the wind turbines and met mast, from the date of commissioning of the entire wind farm is being sought. This reflects the lifespan of modern-day turbines.

A permanent planning permission is being sought for the substation and all associated electrical plant, equipment cabling security fencing and gates, wastewater holding tank, and all ancillary structures and works as these will become an asset of the national grid under

the management of ESB & EirGrid and will remain in place upon decommissioning of the wind farm.

The Grid Connection consists of one 38 kV substation (to include one control building with welfare facilities, all associated electrical plant and equipment, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works) and a 38 kV cable to connect to Ballyvouskill 220 kV Substation.

A temporary access road off the N22 in the townland of Cummeenavrick will facilitate the safe turning of vehicles leaving the Site.

Permission is not being sought for a Grid Connection Route or the turning area in Cummeenavrick, however the below is assessed as part of the Project in the EIAR:

- All works associated with the permanent connection of the wind farm to the national electricity grid comprising a 38 kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation, in the townland of Inchamore and onto the townlands of Inchamore, Derreenaling, Derryreag, Cummeenavrick, Glashacormick, Clydaghroe and Cummeennabuddoge to the existing Ballyvouskill 220 kV Substation in the townland of Caherdowney.
- The construction of a temporary access road off the N22 in the townland of Cummeenavrick to facilitate a 180 degrees turning manoeuvre by construction vehicles and reinstatement at the end of the construction period.

1.6 ENVIRONMENTAL IMPACT ASSESSMENT

1.6.1 Environmental Impact Assessment Requirement and National Legislation

European Union Directive 2011/92/EU ("the EIA Directive") requires that, before consent is given for certain public and private projects, an assessment of the effects on the environment is undertaken by the relevant competent authority. The EIA Directive has been transposed into Irish legislation, for the purposes of this EIA Development, by the Planning and Development Act 2000, as amended ("the Planning Acts") and the Planning and Development Regulations 2001, as amended ("the Planning Regulations").

Section 171A of the Planning and Development Act 2000 (as amended) defines an Environmental Impact Assessment (EIA) as '*a process—*

(a) consisting of—

(i) the preparation of an environmental impact assessment report by the applicant in accordance with this Act and regulations made thereunder,

(ii) the carrying out of consultations in accordance with this Act and regulations made thereunder,

(iii) the examination by the planning authority or the Board, as the case may be, of—

(I) the information contained in the environmental impact assessment report,

(II) any supplementary information provided, where necessary, by the applicant in accordance with section 172(1D) and (1E), and

(III) any relevant information received through the consultations carried out pursuant to subparagraph (ii),

(iv) the reasoned conclusion by the planning authority or the Board, as the case may be, on the significant effects on the environment of the proposed development, taking into account the results of the examination carried out pursuant to subparagraph (iii) and, where appropriate, its own supplementary examination, and

(v) the integration of the reasoned conclusion of the planning authority or the Board, as the case may be, into the decision on the proposed development, and

(b) which includes—

(i) an examination, analysis and evaluation, carried out by the planning authority or the Board, as the case may be, in accordance with this Part and regulations made thereunder, that identifies, describes and assesses, in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the proposed development on the following: (I) population and human health; (II) biodiversity, with particular attention to species and habitats protected under the Habitats Directive and the Birds Directive; (III) land, soil, water, air and climate; (IV) material assets, cultural heritage and the landscape; (V) the interaction between the factors mentioned in clauses (I) to (IV), and

(ii) as regards the factors mentioned in subparagraph (i)(I) to (V), such examination, analysis and evaluation of the expected direct and indirect significant effects on the environment derived from the vulnerability of the proposed development to risks of major accidents or disasters, or both major accidents and disasters, that are relevant to that development.

Section 172(1)(a)(ii)(I) requires projects of a class specified in Part 2 of Schedule 5 of the Planning Regulations to be subject to an EIA where:

"(I) *such development would exceed any relevant quantity, area or other limit specified in that Part,*".

Part 2 of Schedule 5 of the Planning Regulations includes the following classes of EIA Development:

Class 3(i) *"Installations for the harnessing of wind power for energy production (wind farms) with more than 5 turbines or having a total output greater than 5 megawatts."*

The Development comes within the scope of Class 3(i).

1.6.2 Directive 2014/52/EU

The EIA Directive (2011/92/EU) was amended by the 2014 EIA Directive (2014/52/EU).

On 1st September 2018, the Minister for Housing, Planning and Local Government published updated guidelines for planning authorities and An Bord Pleanála on carrying out Environmental Impact Assessments. The publication of the Guidelines coincides with the coming into operation on 1st September 2018 of the provisions of the European Union (Planning and Development) (EIA) Regulations 2018 (S.I. No. 296 of 2018), which were signed by the Minister on 26th July 2018. These Regulations transpose the requirements of Directive 2014/52/EU, amending previous Directive 2011/52/EU, on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) into planning law.

Accordingly, this EIAR complies with the European Union (Planning and Development) (EIA) Regulations 2018 (S.I. No. 296 of 2018). To the extent relevant and necessary, regard has been given to the existing provisions of the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001, (as amended) insofar as they transpose the EIA Directive. Article 5 of the EIA Directive as amended provides where an EIA is required, the developer shall prepare and submit an Environmental Impact Assessment Report (EIAR). The information to be provided by the developer shall include at least:

(a) *a description of the Development comprising information on the site, design, size and other relevant features of the Development*

(b) *a description of the likely significant effects of the Development on the environment*

(c) a description of the features of the Development and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment

(d) a description of the reasonable alternatives studied by the developer, which are relevant to the Development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the Development on the environment

(e) a non-technical summary of the information referred to in points (a) to (d) and

(f) any additional information specified in Annex IV relevant to the specific characteristics of a particular Development or type of Development and to the environmental features likely to be affected.

The EIAR provides information on the receiving environment and assesses the likely significant effects of the Development and proposes mitigation measures to avoid or reduce these effects. The function of the EIAR is to provide information to allow the competent authority to reach a reasoned conclusion on the effects of a development and inform subsequent decisions, such as planning. All elements of the Project (including the grid connection and turbine delivery route) have been assessed as part of this EIAR.

1.6.2.1 EIA Definition

Article 1(2)(g) of the EIA Directive as amended defines EIA as a process consisting of:

"(i) the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);

(ii) the carrying out of consultations as referred to in Article 6 and, where relevant, Article 7;

(iii) the examination by the competent authority of the information presented in the environmental impact assessment report and any supplementary information provided, where necessary, by the developer in accordance with Article 5(3), and any relevant information received through the consultations under Articles 6 and 7;

(iv) the reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and

(v) the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a".

1.6.2.2 Factors of the Environment

The EIA Directive as amended requires the EIA to identify, describe and assess, in an appropriate manner and in light of each individual case, the direct and indirect significant effects of a project on the following factors:

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives;

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape, and

(e) the interaction between the factors referred to in points (a) to (d).

The effects referred to above shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.

The implementations of the EIA Directive as amended in the EIAR can be seen in **Table 1.2.**

Table 1.2: Outline of respective chapters relating to the requirements of the EIA Directive as amended

The EIA Directive	Chapter	Title
(a) population and human health	4	Population and Human Health
(b) biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives	5 6 7	Terrestrial Ecology Aquatic Ecology Ornithology
(c) land, soil, water, air and climate	2 5 6 7 8 9 10 13	Project Description (land) Terrestrial Ecology (land) Aquatic Ecology (land) Ornithology (land) Soils and Geology (land) Hydrology and Hydrogeology Air and Climate Material Assets & Other Issues (land)
(d) material assets, cultural heritage and the landscape	13 14 12	Material Assets & Other Issues Cultural Heritage Landscape and Visual Amenity
(e) the interaction between the factors referred to in points (a) to (d)	16	Major Accidents and Natural Disasters

The EIA Directive	Chapter	Title
	17	Interactions of the Foregoing

1.6.2.3 Major Accidents and Disasters

The EIA Directive as amended requires the EIAR to consider the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned. This is discussed in further detail in **Chapter 16: Major Accidents and Natural Disasters**.

A wind farm is not a recognised source of chemical pollution. Should a major accident or natural disaster occur, the potential sources of pollution onsite during both the construction and operational phases are limited. Sources of chemical pollution with the potential to cause significant environmental pollution and associated negative effects on health include bulk storage of hydrocarbons or chemicals and storage of wastes. Spills and leaks can occur if they are not mitigated against which may cause negative effects to human health, if contamination of food or water occurs. The occurrence of such spills and leaks is unlikely as bunding and safe storage practices will be complied with. The Site is not regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e., SEVESO sites and so there is no potential effect from this source. All SEVESO sites are located approximately 50 km or more from the Development.

There is limited potential for natural disasters to occur at the Site. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to peat-slide, flooding and fire.

- The Peat Stability Assessment Risk Ranking ranged from 'Very Low to Low with the exception of Moderate or High-risk point locations associated with deeper peat and/or steeper inclines and/or close proximity to sensitive receptors'. The risk of peat-slide is further addressed in **Chapter 8: Soils and Geology**.
- There are no recorded localised flood events within the vicinity of the Site. The risk of flooding is addressed in **Appendix 9.1: Flood Risk Assessment**.
- A 2020 article in Wind Power Engineering Magazine estimated that 1 in 2,000 wind turbines catch fire each year. Overall, the data shows that wind turbine fires are relatively rare. It is therefore considered that the risk of significant fire occurring, affecting the wind farm and causing the wind farm to have significant environmental effects is limited. This is discussed in **Chapter 16: Major Accidents and Natural Disasters**.

- As described earlier, there are no significant sources of pollution in the wind farm with the potential to cause environmental or health effects. Also, the spacing of the turbines and distance of turbines from any properties limits the potential for impacts on human health. This is further discussed in **Chapter 16: Major Accidents and Natural Disasters**.

Article 5(1)(d) of the EIA Directive as amended requires that the EIAR include a description of the reasonable alternatives studied by the developer, which are relevant to the Development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the Development on the environment.

In addition, Annex IV, paragraph 2 provides that the EIAR include "*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.*".
This is addressed in **Chapter 3: Alternatives Considered** of this EIAR.

1.6.2.4 National Guidance

The following documents have been referred to in the preparation of this EIAR:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, EPA, May 2022;
- Department of Housing, Planning and Local Government 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment' (August 2018).

In addition to the applicable EIA legislation and guidance, all EU Directives and national legislation relating to the specialist areas have also been considered as part of the process and are addressed in the relevant assessment chapters. Subject-specific best practice guidance used for each appraisal presented in the EIAR is detailed in the relevant assessment chapter of this EIAR.

1.6.2.5 European Guidance

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, 2017
- Environmental Assessments of Plans, Programmes and Projects – Rulings of the Court of Justice of the European Union (European Union 2017a)

- Environmental Impact Assessment of Projects – Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU) (European Union 2017b)
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999)

1.6.2.6 Competent Experts and Quality of the EIAR

Article 5(3) of the 2014 EIA Directive states that, in order to ensure the completeness and quality of the EIAR, the Applicant shall ensure (a) the EIAR is prepared by competent experts; (b) the competent authority shall ensure that it has, or has access to, sufficient expertise to examine the EIAR, and (c) where necessary, the competent authority shall seek from the Applicant any supplementary information, in accordance with Annex IV (the information to be contained in the EIAR), which is directly relevant to reaching the reasoned conclusion on the significant effects of the Development on the environment.

Article 94(e) of the Planning and Development Regulations 2001 (as amended) requires the following information to be provided in an EIAR:

"(e) a list of the experts who contributed to the preparation of the report, identifying for each such expert—

(i) the part or parts of the report which he or she is responsible for or to which he or she contributed,

(ii) his or her competence and experience, including relevant qualifications, if any, in relation to such parts, and

(iii) such additional information in relation to his or her expertise that the person or persons preparing the EIAR consider demonstrates the expert's competence in the preparation of the report and ensures its completeness and quality."

The experts involved in the preparation of this EIAR are competent, having regard to the task he or she performed, taking account of the scope of the study for which he or she undertook the work, the person/s possess sufficient training, experience and knowledge appropriate to the nature of the work.

This EIAR has been prepared by Jennings O'Donovan & Partners Limited (JOD), Consulting Engineers, Finisklin Business Park, Sligo, F91 2HH9, on behalf of the Developer. JOD are one of the longest established and most reputable multi-disciplinary engineering consultancies in Ireland. Established in 1950, it has grown to be the largest engineering consultancy in the north-west of Ireland. JOD have been an established presence in the Renewable Energy Wind Farm Sector since 1998. To date, the company has been working on a portfolio of projects extending to over 2,040 MW of power in Ireland

and Northern Ireland and is a recognised market leader in the area of Wind Energy development. This portfolio will equate, when completed, to an investment of €3 billion in the Wind Energy Sector. Additionally, JOD has attained certificates in line with industry standards as follows:

- ISO 9001:2015 – Quality Management System
- ISO 14001:2015 – Environmental Management System
- ISO 45001:2018 – Occupational Health and Safety Management System

Possession of these certificates is, in itself, evidence that JOD, have developed, maintained and implemented systems in quality, safety and environmental related matters and are therefore competent experts.

This project has been completed in line with JOD's Integrated Management System which is based on the current versions of ISO 9001 (Quality Management System), ISO 14001 (Environment Management System) and ISO 45001 (Safety Management System). JOD are fully certified and accredited to ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 for the provision of project management, environmental, civil and structural consulting engineering services.

JOD have developed a Quality Policy Statement, an Environmental Policy Statement and a Safety Health and Welfare Policy Statement. It is a stated objective in our Quality Policy Statement that:

"…Jennings O'Donovan and Partners Limited is committed to complying with the requirements of the quality management system and to continually improve its effectiveness…".

JOD staff are degree qualified in their respective specialist fields and have developed their competence through both experience on the job and through training. Each team member has developed the following:

- Sufficient knowledge of the specific tasks to be undertaken and the risks which may arise, and
- Sufficient experience and ability to carry out their duties in relation to the project and to take appropriate actions required under the EIA Directive

Specialist consultancies have been employed to complete some of the EIAR Chapters. Each Chapter of the EIAR includes a Statement of Authority regarding the section of the

EIAR for which the author is responsible, the competency of the author and relevant qualifications. Please see section 1.9 for more information.

1.6.2.7 Information to be Included in a Decision to Grant

Article 8a (1) of the EIA Directive as amended states:

"The decision to grant development consent shall incorporate at least the following information:

(a) the reasoned conclusion referred to in Article 1(2)(g)(iv);

(b) any environmental conditions attached to the decision, a description of any features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment as well as, where appropriate, monitoring measures".

To assist the Council with this requirement, the EIAR includes a summary at the end of each chapter of all proposed mitigation and monitoring measures outlined within the technical assessments. A summary document has also been appended to **Chapter 17: Interactions of the Foregoing (Appendix 17.1: Schedule of Mitigation Measures)**.

1.7 NEED FOR THE DEVELOPMENT

The proposed Inchamore Wind Farm will contribute renewable energy in order to assist in the transition of Ireland's energy sector to a low carbon economy. The Project has an estimated Maximum Export Capacity (MEC) of between 28 MW and 33 MW. The exact MEC will be dependent on the output power of the models available at procurement stage. The Project will play a significant role in providing renewable electricity in the Ireland, accounting for approximately 0.75% of the current installed wind energy capacity (Wind Energy Ireland, 2021). At a strategic level, the need for the Project is supported by International, European, and National environmental and energy commitments and policies.

Under the 2009 Renewable Energy Directive, Ireland committed to produce at least 16% of all energy consumed by 2020 from renewable sources. This was to consist of 40% from renewable electricity, 12% from renewable heat and 10% from the renewable transport sector.

The Irish Government published the Climate Action Plan in June 2019 (DoCCAE, 2019) which sets out actions to ensure Ireland's 2030 renewable energy targets can be achieved. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date. These targets have recently been updated in the Climate Action Plan 2023

which has increased the target of renewable energy from 70% as included in the 2019 CAP to 80% by 2030. This target is to be achieved partly by the delivery of 8 GW of onshore wind energy.

REPower EU Energy Plan 2022

The European Commission presented the REPowerEU plan on 18 May 2022[2]. The plan is a key pillar in the EU's response to the disruption which has been caused to energy markets and aims to tackle the climate crisis by transforming Europe's energy system. The plan also forms part of the EU's wider response to Russia's invasion of Ukraine, including several sanctions packages.

Within the overarching goals of strengthening Europe's climate ambitions, security and economic growth, the REPowerEU plan responds to the current energy situation in four ways:

- energy savings;
- the diversification of energy imports;
- the acceleration of Europe's clean energy transition, and
- smart investment.

The European Commission has laid down a framework to accelerate the deployment of renewable energy (Council Regulation (EU) 2022/2577 of 22 December 2022). Member States should establish "go-to" areas for renewable energy development. These areas would have lower environmental risks and therefore allow shortened and simplified permitting processes.

This renewable energy Project will aid in the diversification of energy production in Ireland and together with other renewable energy projects and developments, will decrease our reliance on imported fossil fuels by becoming energy self-efficient.

[2] REPowerEU: A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition, European Commission – Press Release. Available online: https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131 [Accessed 22/07/2022]

The Climate Action Plan 2023

The Climate Action Plan 2023 aims to evaluate in detail the changes that are required in order "*to halve our emissions by 2030 and reach net zero no later than 2050, as we committed to in the Programme for Government*".

In relation to electricity generation there is a commitment to increase the reliance on renewables to 80%, which includes increasing the target of offshore wind energy by up to 7 GW[3]. The target for onshore wind energy is 9 GW, by 2030.

The European Commission announcement[4] in March 2022 addresses energy security issues emerging from Russia's invasion of Ukraine. The EU intends on significantly accelerating its transition to clean energy and thereby increasing Europe's energy independence.

"*Phasing out our dependence on fossil fuels from Russia can be done well before 2030. To do so, the Commission proposes a REPowerEU plan that will increase the resilience of the EU-wide energy system based on….*
…Reducing faster our dependence on fossil fuels at the level of homes, buildings and the industry, and at the level of the power system by boosting energy efficiency gains, increasing the share of renewable and addressing infrastructure bottlenecks"

The contribution of the Development to the de-carbonisation of the Irish electricity network will contribute positively to an issue of strategic social importance. This is illustrated by the text of the Irish government's Climate Action Plan 2023 which sets an ambitious 80% target for electricity production from renewable sources by 2030 and highlights the need to remove barriers to the development of renewables, including onshore wind, such as streamlining regulation and encouraging reinforcement of the grid to facilitate greater renewables penetration. The significance of the Climate Action Plan is underlined by the Irish government's declaration of a climate emergency in 2019.

Ireland is facing significant challenges in efforts to meet these targets, alongside its commitment to transition to a low carbon economy by 2050. Ireland did not meet its 2020

[3]SSE RENEWABLES HAILS IRELAND'S INCREASED 7GW OFFSHORE WIND AMBITION BY 2030, 29 Jul 2022 [Accessed Online 08/02/2023] https://www.sserenewables.com/news-and-views/2022/07/sse-renewables-hails-ireland-s-increased-7gw-offshore-wind-ambition-by-2030/

[4] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions [08/03/2022]. REPowerEU: Joint European Action for more affordable, secure and sustainable energy

target for renewable energy and is falling behind in the longer-term movement away from fossil fuels.

The Renewable Energy Directive (recast) 2018/2001/EU

The Renewable Energy Directive (recast) 2018/2001/EU entered into force in December 2018. It entered into force, as part of the Clean energy for all Europeans package, aimed at keeping the EU a global leader in renewables and, more broadly, helping the EU to meet its emissions reduction commitments under the Paris Agreement. It was transposed into Irish law in September 2020 by the Renewable Energy Regulations 2020. The regulations set the parameters for the establishment of future renewable electricity support schemes, and build on the existing regime, which was created by the European Union (Renewable Energy) Regulations 2014 (as amended) (the "2014 Regulations"). The ambition of increased electricity from renewable sources will be significantly ramped up. The recast directive moves the legal framework to 2030 and sets a new binding renewable energy target for the EU for 2030 of at least 32%, with a clause for a possible upwards revision by 2023, and comprises measures for the different sectors to make it happen. Failure to meet renewable energy targets is subject to fines from the EU.

Wind Energy Ireland (WEI), Ireland's largest renewable energy organisation, in its annual report for 2020 noted that Ireland's wind energy share of electricity demand in 2020 rose to 36.3% compared to 32.5% in 2019. Wind Energy Ireland in its February 2022 Wind Energy report showed that wind energy provided 53 per cent of Ireland's electricity that month. This is the highest share of demand ever achieved by wind in Ireland.
The total installed capacity of the Republic of Ireland's wind farms is now 4,255 MW (the latest publication of the Annual Report, 2020)[5]; this is approximately enough to power 2.2 million Irish homes annually.

The Project is critical to helping Ireland address these challenges as well as addressing the country's over-dependence on unsustainable imported fossil fuels. The need for the Development is driven by the following factors:

- A requirement to diversify Ireland's energy sources, to achieve national renewable energy targets;
- Reduce Ireland's dependency on fossil fuels resulting in lower carbon dioxide (CO_2) emissions;
- Avoid significant fines from the EU (the EU Renewables Directive);

[5] https://windenergyireland.com/latest-news/5364-annual-report-confirms-wind-energy-leads-fight-against-climate-change [Accessed on the 07/12/2021]

- A legal commitment under the Kyoto protocol from Ireland to limit greenhouse gas emissions;
- Aid in the acceleration of actions towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change (COP26 and COP27);
- A requirement to increase Ireland's national energy security as set out in the Energy White Paper (Ireland's Transition to a Low Carbon Energy Future, 2015-2030[6]);
- Provision of cost-effective power production for Ireland which would deliver local benefits, and
- Increase energy price stability in Ireland by reducing an over-reliance on imported gas and exposure to international market price and supply fluctuations.

The Development will also offer opportunities such as:

- The provision of clean energy whilst minimising environmental impacts, and
- Contributing to renewable energy targets which will continue to drive down the overall cost of energy with benefits to the Irish consumer.

The Development will create additional jobs and will encourage continued investment in the renewable industry in Ireland.

1.7.1 Public Consultation

The project at an early stage appointed a local Community Liaison Officer (CLO) in July 2020. The role of a CLO is to introduce and communication key project information, timelines, updates, activities, benefits and proposals through direct and indirect community engagement, meetings, and events with the projects near neighbours and the wider community throughout the project lifecycle.

Initially the CLO's direct engagement focused on calling to houses within 2 km of the project area. These visits were used to provide Project updates as follows:

- Newsletter 1 in July/August 2020;
- Newsletter 2 in March 2021;
- Newsletter 3 in September 2021;
- Project update letter in November 2021;
- An Introduction letter to FuturEnergy Ireland from the CEO in December 2021;
- A further project update letter in March/April 2022, and

[6] Ireland's Transition to a Low Carbon Energy Future, 2015-2030, Department of the Environment. Climate and Communications, 2020. https://www.gov.ie/en/publication/550df-the-white-paper-irelands-transition-to-a-low-carbon-energy-future-2015-2030/

- A project update letter in November 2022.

During May 2022 FuturEnergy Ireland sponsored and arranged an Educational Program around "Climate Change" for 5 local National schools around the Project area which was well received.

In March 2023 a Media release was sent to local and regional journalists in the Southern Star, The Corkman, Irish Examiner, Radio Na Gealtachta and 96Fm launching the Inse Mhór Wind Farm's detailed project brochure and Virtual Tour Exhibition.

The detailed 36-page project brochure and invite letter to the projects virtual tour exhibition was also distributed at this time to the Project's near neighbours and wider community out to 5 km, and also to local interest groups and elected representatives.

In April 2023, advertisements were placed in the Southern Star, the Corkman, and the Kerryman newspapers displaying the details of the location, dates, and times of the two-day local on-site community engagement clinic to be held by the Project in Coolea village on 20th and 21st April.

Early in the engagement process, the CLO contacted and kept local interest groups from the wider community and local elected representatives up to date and informed of Project progress. This engagement commitment has continued throughout the whole engagement process and will continue to do so into the future.

The CLO was on hand to discuss any queries, comments or concerns that residents may have had during the project's engagement lifecycle and as required were replied to by the project team. Some requests for information were logged so that when the information become available it would be provided.

The CLOs work also included Saturdays and some midweek evenings in an effort to reach out to all.

At all stages of the Project's engagement cycle from 2020 to 2023, the Project communications material included contact numbers, project email addresses, postal addresses, and details of the dedicated Project website www.inchamorewindfarm.ie (when launched in early 2021). From this time onward all project updates and newsletters were continuously uploaded to the dedicated project website.

To acknowledge the region's Gaeltacht culture and heritage, the majority of our communications were provided in both Irish and English.

1.7.1.1 Public Information Days (PIDs)

The public information days were held on April 20th and 21st 2023 at Arus Éamon Mac Suibhne, Cúil Aodh, Co Chorcaí. P12 HY57 (a venue close to the site and easily accessible to local residents). Which took place between the hours of 12:00 and 20:00 on the Thursday and between 12:00 and 18:00 on the Friday, to give as many of the community members as possible the chance to attend, to view the proposals and ask questions of the Project team.

A Pre-Application Community Consultation (PACC) Report has been submitted to Cork County Council and Kerry County Council as a standalone document as part of this planning application. The PACC Report summarises the engagement and consultation that has taken place with the local community over the project lifecycle to date. Starting from the introduction of the project through to the Project's submission into planning, the PACC report includes reports of the public information day, how we intend to continually engage with the local community into the future and how comments received have been addressed and incorporated by the Project.

1.8 EIAR STRUCTURE

This EIAR uses the grouped structure method to describe the existing environment, the potential impacts of the Development thereon and the proposed mitigation measures. Background information relating to the Development, scoping and consultation undertaken and a description of the Development are presented in separate sections of this EIAR. Please note that the Irish Transverse Mercator coordinate system is used in the EIAR document.

The layout of this EIAR is arranged in four volumes, I-IV.

Volume I: This volume includes the opening **Non-Technical Summary (NTS).** It is a condensed and easily comprehensible version of the EIAR document. The NTS is presented in a similar format to the main EIAR document and comprises descriptions of the Development, the receiving environment, impacts, mitigation measures and interactions presented in a grouped format. It is a standalone document.

Volume II: This volume contains the **Environmental Impact Assessment Report (EIAR).** The EIAR is presented using the grouped structure method and describes the existing environment, the potential impacts of the Development thereon and the proposed mitigation measures. Background information relating to the Development, scoping and consultation undertaken and a description of the Development are presented in separate Chapters. The grouped format chapters describe the impacts of the Development in terms of human beings, biodiversity, soils and geology, hydrology and hydrogeology, air and climate, noise, landscape and visual, cultural heritage and material assets such as traffic and transportation together with the interaction of the foregoing.

The chapters in this **Volume II: EIAR** are as follows:

- Chapter 1: Introduction
- Chapter 2: Project Description
- Chapter 3: Alternatives Considered
- Chapter 4: Population and Human Health
- Chapter 5: Terrestrial Ecology
- Chapter 6: Aquatic Ecology
- Chapter 7: Ornithology
- Chapter 8: Soils and Geology
- Chapter 9: Hydrology and Hydrogeology
- Chapter 10: Air and Climate
- Chapter 11: Noise
- Chapter 12: Landscape and Visual Amenity
- Chapter 13: Material Assets and Other Issues
- Chapter 14: Cultural Heritage
- Chapter 15: Traffic and Transportation
- Chapter 16: Major Accidents and Natural Disasters
- Chapter 17: Interactions of the Foregoing

Volume III: EIAR Figures

The Figures referred to in each chapter of the EIAR are compiled separately in Volume III. Figures are numbered sequentially for each chapter in which they are principally referred.

Volume IV: Appendices

The Appendices referred to in each chapter of the EIAR are compiled separately in Volume IV. They are also numbered sequentially for each chapter in which they are principally referred.

1.9 EIAR PREPARATION

1.9.1 Project Team

JOD had overall responsibility for the coordination of the EIAR with input from other independent specialist consultants where necessary. The competency of JOD has been outlined in **Section 1.6.2.6**. **Table 1.3** provides details of the contributors of each aspect of the EIAR. Further details on the qualifications of each lead author can be found in **Section 1.9.2** and in the Statement of Authority in each individual technical assessment chapter.

Table 1.3: EIAR Preparation Details

Consultants	Principal Staff Involved in the Project	EIAR Input
Jennings O'Donovan & Partners Limited	David Kiely (DK) Sean Molloy (SM) Sarah Moore (SME) Breena Coyle (BC) Anthony McCoubrey (AMcC) John Doogan (JD) Shirley Bradley (SB)	Project Management, Scoping and Consultation, EIAR Sections • 1: Introduction (SME & SB) • 2: Project Description (SME, SB & SM) • 3: Alternatives Considered (SME & SB) • 4: Population & Human Health (SME & SB) • 10: Air & Climate (SME & SB) • 13: Material Assets (SME & SB) • 15: Traffic & Transportation (DK, JD & AMcC) • 16 Major Accidents and Natural Disasters (SME & SB)

Consultants	Principal Staff Involved in the Project	EIAR Input
		• 17 Interactions of the Foregoing (SME & SB)
Biosphere Environmental Services	Brian Madden With expert contributions from John Conaghan (Habitat surveys) Tina Aughney (Bat surveys) and Patrick Crushell (Kerry Slug Surveys) Karen Banks, Jonathon Dunn & Sinead Clifford (Fehily Timoney - Bird & Bat surveys)	Scoping responses and Consultation, EIAR Chapters 5: Terrestrial Ecology & Chapter 7: Ornithology
EirEco Environmental Consultants	Paul Murphy	Scoping responses and Consultation, EIAR Sections 6: Aquatic Ecology
Minerex	Cecil Shine (Chapter Review) Sven Klinkenbergh (Chapter preparation) Chris Fennel (Chapter preparation) Lissa Colleen McClung (Chapter preparation)	Scoping responses and Consultation, EIAR Sections 8: Soils & Geology 9: Hydrology & Hydrogeology
Brendan O'Reilly, Noise & Vibration Consultants Limited	Brendan O'Reilly	Scoping responses and Consultation, EIAR Sections 11: Noise (Assessment)
Irwin Carr Consulting	Shane Carr	Scoping responses and Consultation, EIAR Sections 11: Noise (Modelling)
Macro Works	Richard Barker	Scoping responses and Consultation, EIAR Chapter 12: LVIA
John Cronin & Associates	Tony Cummins (Cultural Heritage Assessment) David Murphy (Field surveys)	Scoping responses and Consultation, EIAR Chapter14: Cultural Heritage

Consultants	Principal Staff Involved in the Project	EIAR Input
Al Bridges	David McGrath (Telecommunications Report preparation) Kevin Hayes (Report review) Patrick Tinney (Modelling) Karla Chagas (Modelling)	Scoping responses and Consultation, EIAR Appendix 13.1 Inchamore Wind Farm Telecommunications Impact Study

1.9.2 Project Team Experience

David Kiely B.E., M.Sc., Eur.Ing., C.Eng., FIEI, MICE, F.RConsEI

David Kiely is a Director of JOD who holds a BE in Civil Engineering from University College Dublin and MSc in Environmental Protection from IT Sligo. He is a Fellow of Engineers Ireland, a Chartered Member of the Institution of Civil Engineers (UK) and has over 40 years' experience. He has extensive experience in the preparation of EIARs and EISs for environmental projects including Wind Farms, Solar Farms, Wastewater Projects, and various commercial developments. David has also been involved in the construction of over 60 wind farms since 1997.

Sean Molloy B.Eng., M.Sc., C.Eng., MIEI, Dip.PM

Sean is a Senior Associate and Senior Project Manager in the JOD Renewable Energy Department with over 15-years' experience. He is a Chartered Engineer with an Honours Master's Degree in Environmental Systems from Galway Mayo Institute of Technology (GMIT) and an Honours Degree in Civil & Transportation Engineering from Edinburgh Napier University. He has also received a Certified Project Management Diploma from the Institute of Project Management Ireland. Sean's professional experience includes managing Environmental Impact Assessments, Civil and Environmental Design, preparation of Planning Documentation and Technical Reports and Stakeholder Consultation.

Sarah Moore MSc, BSc Env.

Sarah is an Environmental Scientist in JOD with over 18 years of environmental consultancy experience. She has obtained a MSc in Environmental Engineering from Queens University, Belfast, and a BSc in Environmental Science from University of Limerick. Since joining JOD, Sarah has been involved as a Project Environmental Scientist on a range of renewable energy, wastewater, structures and commercial projects. She has experience in the preparation of Appropriate Assessments, Ecological Impact Assessments, Environmental Impact Assessments and Geographic Information Systems.

Breena Coyle BA, MSc MRTPI HD Planning and Environmental Planning Law

Breena has over 14 years' experience in the private sector and has a thorough knowledge of the planning system. Breena holds a MSc in Environmental Planning from Queens University Belfast and a Bachelor of Arts in History & Geography from NUI Galway. She is a Member of the Irish Planning Institute and a Member of the Royal Town Planning Institute. Since joining JOD, she has developed experience in a range of sectors through various projects and planning issues with a current focus within the environmental and renewable energy sector.

Anthony McCoubrey Cert.Civil.Eng

Anthony is a Senior Technician in JOD with over 35 years' experience. He has been involved in the preparation of planning through to as constructed drawings, land surveying and land transaction mapping for numerous renewables, commercial, water and wastewater projects. Anthony has received a National Certificate in Civil Engineering from the Institute of Technology, Sligo.

John Doogan Dip.Civil.Eng.

John Doogan is a Senior Designer at JOD. He has a National Diploma in Civil Engineering from Bolton Street College of Technology, Dublin and has over 32 years of road design experience. John has worked on over 30 wind farms in Ireland and Sweden.

Shirley Bradley B.Sc. (Hons)

Shirley is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley has two years' experience in consultancy and her key capabilities include preparation of Environmental Impact Assessment Reports, writing management plans, running software such as WindPRO 3.6 and ArcGIS Pro and assisting with project management.

Dr Brian Madden BA (Mod.), PhD, MCIEEM (botanist and ornithologist)

Brian Madden graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D. degree in 1990 from the National University of Ireland for his research on ecosystem processes in Mongan Bog, a raised bog in Co. Offaly (research work sponsored by Bord na Móna and Royal Irish Academy). Since then, he has carried out botanical surveys and habitat assessments for most terrestrial habitats which occur on the island of Ireland.

Brian is an experienced ornithologist, with particular interests in birds of prey and wetland birds. He has published a range of research papers, including papers on the birds of Mongan Bog, the impacts of wind farms on Hen Harriers, and the status of the Peregrine Falcon in Ireland. Brian is the principal ecologist with BioSphere Environmental Services.

Joe Adamson

Joe Adamson B.Sc., M.Sc., MCIEEM is a consultant senior ornithologist with BioSphere Environmental Services. He is highly experienced, having worked in the field of ornithology and ecology since 1988 and has extensive knowledge of Irish birds and their habitats. Joe has been involved in baseline bird surveys on the Bord na Móna cutaway bogs since 2014 and carries out winter and summer bird surveys. Joe carried out baseline ornithological surveys for the project.

Aidan Duggan

Aidan Duggan has more than 30 years of bird surveying experience in Ireland and abroad and is an active member of the Cork branch of Birdwatch Ireland. Aidan has worked on a variety of projects throughout Ireland and is proficient in Vantage Point surveys, Transect Surveys, Hinterland surveys, merlin surveys and red grouse surveys. Clients include Fehily Timoney & Co. Consultants, BioSphere Environmental Services, and Kelleher Ecology Services. Aidan carried out baseline ornithological surveys for the project.

Dr John Conaghan BSc., PhD, MCIEEM – habitats, vegetation & flora

John Conaghan is an experienced plant ecologist who has worked as a consultant ecologist in Ireland since 1994. He is a specialist in the survey and assessment of wetland vegetation and habitats with bogs and fens his main area of expertise. These surveys and assessments have contributed towards Environmental Impact Assessment Reports of a range of wind farm, power line, road, and gas pipeline developments.

John Curtin BSc.- bat surveys

John Curtin holds a BSc in Environmental Science from NUI Galway and has been working as a consultant ecologist since 2010. John is an experienced ecologist with a high skillset over several disciplines. A skilled field worker; with experience in botanical & habitat identification, ornithological surveys & monitoring, mammal surveys. John has also acted as lead bat ecologist for several large scale wind farm projects. John carried out bat surveys at Inchamore Wind Farm in 2021.

Tina Aughney B.Sc., Ph.D

Tina is an experienced bat ecologist with a B.Sc. in Environmental Science from University of Galway, 1996 and a Ph.D in Environmental Science from National University Ireland, Galway, 2000. Tina co-ordinates the All Ireland Daubenton's Bat Waterways Survey and the Brown Long-eared Bat Roost Monitoring Scheme. In addition, Tina undertakes numerous bat walks and talks, administration and training of volunteers. Tina undertook the 2022 bat surveys for the proposed Inchamore Wind Farm.

Dr Patrick Crushell BSc MSc PhD MCIEEM CEcol

Patrick holds an honours degree in Applied Ecology from University College Cork, 1997, a Masters degree in Environmental Resource Management from University College Dublin, 2000 and a PhD on peatland ecology from Wageningen University, the Netherlands, 2008. Patrick's skills include project management, ecological field surveying, GIS mapping and report preparation.

Karen Banks (Fehily Timoney Consultants) – bat activity and roost surveys.

Karen is an ecologist with 13 years' experience in the field of ecological assessment. She holds a BSc in Environment and Development from Durham University and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen is an experienced and skilled bat surveyor, first gaining a scientific licence to disturb bats from Natural England, UK in 2008.

Dr Jonathon Dunn (Fehily Timoney Consultants) – bat static detector surveys in 2019/20.

Jonathon is an ecologist with over seven years' experience in the environmental sector with specialism in spatial analyses and bird ecology/conservation. Jonathon holds a BA (Hons) in Natural Sciences (Zoology) from the University of Cambridge, an MSc in Ecology, Evolution and Conservation from Imperial College London and a PhD in Avian Ecology from Newcastle University. Jonathon is an ecologist currently located in Ireland.

Sinéad Clifford (Fehily Timoney Consultants)

Sinéad Clifford is a Graduate Ecologist working as part of the Energy and Environment Team at Fehily Timoney and Company (FT). She is a Graduate member of Chartered Institute of Ecology and Environmental Management (CIEEM) Sinéad Clifford holds a BA (Hons) from Institute of Technology, Tralee and a Certificate in Ecological Consultancy from Acorn Ecology and is fully trained in sound analysis of bat calls. Sinéad has conducted habitat surveys, including Appropriate Assessment (AA), ornithological surveys, and

ecological appraisals. She has also carried out bat surveys, including preliminary surveys, activity surveys and sound analysis.

Paul Murphy *MSc Dip Aq Biol CEnv MCIEEM MIFM*

Paul Murphy is the Director of EirEco Environmental Consultants. He is an approved surveyor by the National Parks and Wildlife Service for various aquatic Annex-listed species and has held numerous licenses for the survey of freshwater pearl mussel (Stage 1 and Stage 2), white-clawed crayfish and lamprey. He regularly undertakes electro-fishing surveys and has held numerous Section 14 Authorizations from Inland Fisheries Ireland. Paul has been involved in river habitat survey for many decades covering riparian and instream habitats and their associated biota and is also experienced in the River Hydromorphology Assessment Technique (RHAT). He regularly carries out biological water quality assessment using the standardized EPA Q-Value methodology in addition to sampling for physic-chemical parameters. He is a qualified HSE Part III Commercial Diver (surface demand) and PADI Divemaster and regularly undertakes surveys in freshwater and marine environments. Paul has garnered a wealth of practical experience in the construction of infrastructure in the aquatic environment and was the principle author of the National Roads Authority Guidelines for the Crossing of Watercourses on National Road Schemes (2005).

Paul has been operating in the environmental field for over two and a half decades covering a broad range of projects in a variety of countries. He has expert knowledge of the various EU Environmental Directives (Habitats Directive, Birds Directive, Water Framework Directive, Environmental Liability Directive, etc.) and the Natura 2000 network and has been involved in the preparation of management plans for designated areas and Natura 2000 sites. He has extensive experience in Environmental Impact Assessment and ecological mitigation design for numerous major infrastructural schemes (roads, bridges, power plants, wind farms, etc.) and is fully conversant with the Appropriate Assessment process having undertaken numerous Screening Reports and Natura Impact Statements for a wide variety of developments. He has extensive experience at defending EIA's at Oral Hearings over a period of more than two decades.

Cecil Shine BSc MSc PGeo EurGeol

Cecil is Managing Director and a Senior Hydrogeologist in Minerex Environmental with a M.Sc. (Masters) in Hydrogeology & Contaminated Land from University of Birmingham, UK, and a B.Sc. (Hons) in Geology from University College Dublin (UCD). He has over 20 years'

experience in hydrogeology both in Ireland and Africa and has employed over 200 staff during that time.

From a background in geology, mineral exploration and hydrogeology, Cecil set up Minerex Environmental in 1994 as a hydrogeological and environmental consultancy focusing on soil and water and is the managing director and chief technical assessor. His extensive managerial and technical experience ranges from groundwater resource exploration and development, catchment management studies, surface and groundwater hydrochemical and hydrometric interactions, groundwater source protection zone (SPZ) delineation, groundwater dependent terrestrial ecosystems (GWDTE) conceptualisation and risk assessment (RA) studies, geohydrological investigation of peatland & wetland environments, well design, yield testing, waste materials sampling and categorisation prior to disposal, environmental impact assessments, hydrogeological investigation and especially site dewatering in the current economic and business climate.

In the field of dewatering and soil classification, Cecil has developed a sought-after reputation around soil and groundwater issues on sites, designing suitable investigation and assessment programmes, implementing same, monitoring (remote, continuous, telemetric) and reporting in a manner that builds confidence and trust amongst arrange of clients and business sectors, including public and private and industry.

Cecil has acted as an expert witness in legal disputes and planning cases. Cecil's particular strengths are in managing staff performance, technical assessment & direction, project scoping and getting results.

Sven Klinkenbergh BSc PG Dip. M.CIWEM

Sven is a Project Manager/Environmental Consultant with over eight years' experience. He has obtained a Post Graduate Diploma in Environmental Protection from IT Sligo (2020) and a Bachelor of Science in Environmental Science from IT Sligo (2013).

Sven is a specialist in undertaking Hydrology, Hydrogeology, Land, Soils and Geology chapters of Environmental Impact Assessment Reporting and associated field investigations. Sven has multiple years' worth of experience in Environmental Monitoring with a focus on surface water and groundwater in addition to soil classification as waste / biproduct. With a background in project management, Sven has carried out multiple Flood Risk Assessments (Stage 1) as well as Peat and Slope Stability Risk Assessments.

Jayne Stephens BSc PhD

Jayne is an Environmental consultant with c. 5 years' experience working in microbiology, water, and environmental disciplines. She graduated with a BSc in Environmental Science from National University of Ireland Galway in 2014, majoring in mammal ecology. Following this, Jayne was the successful Irish applicant to the Tropical Biological Association in Cambridge to complete a field course in tropical biodiversity and conservation in Tanzania. She holds a PhD in environmental microbiology, graduating in 2023. Jayne has worked on a large number of bathing water and surface water monitoring investigations, on project Acclimatize, an EU funded project which aimed to bridge the knowledge gap in relation to at-risk urban and rural bathing waters in Ireland and Wales. During this project, Jayne was team lead for site investigations and has a number of years' experience on microbial contamination and public involvement projects for better water quality.

Dr Chris Fennel BA (mod), PG Cert., Ph.D.

Chris is a Project Hydrogeologist with over five years' experience. He has received a B.A (mod) in Environmental Science (First class) from Trinity College Dublin, a Post Graduate Certificate in Statistics from Trinity College Dublin and a Ph.D. in Civil, Structural and Environmental Engineering from Trinity College Dublin.

He is currently working on projects throughout Ireland pertaining to groundwater sampling, gas monitoring, critical analysis of results and subsequent reporting, site dewatering infrastructural setup and maintenance.

Lissa Colleen McClung BSc MSc

Colleen has recently joined Minerex Environmental Limited (RSK Ireland) as a Graduate Project Scientist under the Hydrology & Hydrogeology and Land, Soils & Geology Team. After attaining an MSc in Environmental Science, with 1.1 First Class Honours, from Trinity College Dublin in 2021 she began the new year with RSK Ireland drafting Environmental Impact Assessments. Colleen has undertaken technical report writing such as Environmental Impact Assessment Reports (Ireland) Environmental Statements (NI) and Flood Risk Assessments (Stage 1 & Stage 2). She has experience in report mapping in GIS and has worked on a number of projects which have involved field work associated with baseline surveying of sites, i.e., initial site walkovers, photographing and GPS logging of data, surface water grab sampling and hydrochemistry analysis.

Mairéad Duffy BSc MSc

Mairead has experience in technical report writing and field work surveying of hydrological and geological elements of the environment with associated proposed green energy projects around the country.

Brendan O'Reilly MPhil ISEE SFA EAA

Brendan has obtained a Master of Philosophy (MPhil) science degree in noise & vibration from the University of Liverpool, (2000). He was a Member of the International Society of Explosives Engineers (ISEE) for over 20 years, a Member of IMQS and Committee member for over 20 years and a member of French Society of Acoustic (FSA) for a number of years.

Brendan has compiled numerous Environmental Noise Impact Statements (EIS) since 1985 for projects ranging from wind farms/sewage treatment plants to mines/quarries and retail development. He successfully completed noise EIS's for over 100 wind farms throughout Ireland ranging in size from 0.65 MW to over 100 MW and has provided expert evidence in An Bord Pleanála oral hearings on large wind farm proposals (Straboy Energy in Co. Donegal and Doonbeg Wind Farm in Co. Clare).

Large wind farm projects, in which Brendan was the noise consultant, with a successful conclusion included Yellow River in Co. Offaly and Sliabh Bawn in Co. Roscommon. Brendan has also completed compliance monitoring on over 20 wind farms including Sliabh Bawn and acted as expert noise witness provided for Drehid Landfill, Fountain Cross Quarry and extension of the Boliden Tara Mines Tailing Storage Facility (2017) and on behalf of residents in EirGrid North/South overhead line.

Brendan has experience in many projects including Europe's largest Zn/Pb mine dealing with a variety of noise and vibration issues over a 35-year period. Other projects in which Brendan has been involved with include the development of the first continuous noise and vibration monitoring system in Europe for an industrial enterprise including the change from an analogue system to a digital integrated noise and wind monitoring system.

Brendan has experience in the investigation of complaints and specification for ameliorative noise and vibration control measures for numerous companies North and South, Consultancies and Local Authorities.

Brendan has been an expert witness as a vibration specialist in the High Court for Meath County Council relating to road construction (vibratory rollers to rock breaking). As well as

this, Brendan has been an expert witness as vibration specialist in Belfast High Court regarding blasting vibration. He is an acknowledged contributor to the Irish EPA Integrated Pollution Control Licensing, 'Guidance Note for Noise in Relation to Scheduled Activities', 1995.

Brendan is also a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas administered by the Environmental Protection Agency on behalf of the Dept. of Environment., Heritage and local Government.

Shane Carr BSc (Hons), MIA, CIEH

Shane is a Director in Irwin Carr Consulting, primarily responsible for environmental noise and noise modelling. He has over 22 years' experience working in both the public and private sectors having previously obtained a BSc (Hons) Degree in Environmental Health and a Post-Graduate Diploma in Acoustics. He is a Member of the Institute of Acoustics and a Chartered Member of the Chartered Institute of Environmental Health.

Shane has carried noise assessments for various wind farm development schemes throughout Ireland in line with the ETSU standard, been responsible for designing the assessment schemes to assess the noise impact for major wind farm redevelopments within Ireland as well as assessing the suitability of proposed sites for residential or commercial/industrial development.

He has a broad range of experience in all aspects of noise including environmental noise assessment and control. He has presented expert evidence on a number of occasions for a range of planning issues and environmental noise assessments.

Shane has contributed to numerous EIA in relation to significant developments in both Northern Ireland and the Republic of Ireland and where the Air Quality or Noise element of assessment is deemed key. He has been responsible for co-ordinating and preparation of the assessment for submission to the appropriate authority. This has included significant renewable energy schemes.

Richard Barker MLA. BA Env. PG Dip for. MILI. – Principal Landscape Architect

Richard formerly worked as a Town Planner in New Zealand, London and Dublin before moving into the field of Landscape Architecture. He has spent the last 16 years working as a Landscape Architect in Ireland and has considerable experience in the fields of both Landscape and Visual Impact Assessment (LVIA) and landscape design, covering all

stages from project feasibility through to construction. This cross-over of expertise is invaluable in determining and designing the most appropriate and effective form of landscape and visual mitigation for infrastructural development projects.

Richard manages the LVIA department in Macro Works undertaking assessment work on a broad spectrum of projects from wind and solar energy, to roads and large-scale industrial and infrastructural development. Richard has personally completed the landscape and visual assessment of over 90 wind farms and 80 solar farms including nine SID projects. Consequently, he has considerable oral hearing expert witness experience. This extends to more than 15 oral hearings over the past 12 years with four of these being for large SID wind farm projects.

Richard has presented a number of conference papers relating to sustainable landscape design and LVIA as well as delivering the inaugural workshop on the landscape and visual effects of wind energy developments on behalf of the Irish Wind Energy Association. He has presented a paper to members of the Irish Landscape Institute on the application of the Guidelines for Landscape and Visual Impact Assessment (2013) using a wind energy case study. Richard has also delivered guest lectures to the University College Dublin professional course in EIA Management in relation to LVIA.

Tony Cummins BA MA – Senior Archaeologist & EIA Consultant

Tony Cummins has been a Senior Archaeologist with John Cronin & Associates since 2009. He holds B.A. and M.A. degrees in archaeology (University College Cork (UCC) 1992/1994) and has accumulated twenty-seven years industry experience. Tony has been a licence-eligible archaeologist since 1998 and has directed numerous excavations in Ireland. He also has a number of years' experience as an archaeological project manager responsible for assessing and supervising large-scale infrastructure projects, including the Limerick Southern Ring Road, the Waterford City Bypass, Killaloe Bypass, County Clare and the Clashavoon-Dunmanway 110 kV transmission, County Cork. He has extensive experience in preparing cultural heritage impact assessments for wind farm projects and his inputs to these have included liaising with project design teams and LVA specialists, as well as consulting with relevant local and national authority specialists. Examples of some of these wind farm projects include: Derrybrien rEIAR (Co. Galway), Coom, Glentane and Knockeenboy (Co. Cork), Shragh (Co. Clare) and Croaghaun Hill (Co. Carlow). Tony carried out desktop research and field inspections for the Inchamore project and was the principal author of the EIAR chapter.

David Murphy BA – Senior Project Archaeologist

David Murphy joined John Cronin & Associates in 2014 as a licence-eligible archaeologist. He holds a B.A. degree in archaeology (UCC 2003) and has accumulated eighteen years industry experience. Since becoming a licence-eligible archaeologist in 2012, David has overseen the completion of a large number of field surveys, monitoring, testing and excavation projects, while also authoring numerous archaeological impact assessments and screening reports for a variety of large infrastructure schemes, including wind farm developments. Between 2016 and 2021, David fulfilled the role of Project Archaeologist at a large-scale ESB wind farm development at Grousemount, Kilgarvan, Co. Kerry. During the course of the Grousemount project, David developed a comprehensive programme of mitigation measures for a range of previously unrecorded archaeological and cultural heritage sites which were identified within lands in the environs of construction areas. David contributed to the desktop research, field inspections and drone surveys carried out as part of the assessment of the Inchamore project.

David McGrath B.Sc. Computing

David is a Radio Planning Engineer in Ai Bridges Ltd. with over 10 years' experience working on radio frequency related projects, in excess of 7 years' experience working with wind farm wireless signal interference and remediation services, and over 5 years' experience of wireless network installations and commissioning.

He has received a B.Eng in Electronic Engineering and is experienced in analysing and troubleshooting RF issues, research and development in varying wireless network projects, and supervision of Dublin Institute of Technology Master's degree students.

Similar projects worked on include: Hunters Hill and Crockagarron Wind Farm, Slieve Kirk Wind Farm, Clydagh Wind Farm, Glenora Wind Farm, Woodhouse Wind Farm, Grouselodge Wind Farm, Bruckana Wind Farm, Mount Lucas Wind Farm, Athea Wind Farm, Dromada Wind Farm, Knockastanna Wind Farm, Rathcathill Wind Farm, Clydaroghe Wind Farm and Tievnameeta Wind Farm.

Patrick Tinney, B.Eng. Electronics, Occupational First Aid

Patrick is a Communications Engineer in Ai Bridges Ltd. with 3 years' experience as a company first aider and representative on Health and Safety committee. He has received a B.Eng. in Computer and IT Systems, with other training including ISRT Advanced Climber and ISRT Rescue Climber. Patrick has experience in conducting site surveys and RF planning using CE4 software prediction tools for UMTS mobile and fixed wireless networks.

He provides on-site support for Chorus roll-out of fixed wireless access in Ireland and RF planning/software modelling using Pathloss and CelPlan software prediction tools.

Previous wind farm projects worked on include: Developed Assessment Survey Methodologies Woodhouse Wind Farm Wireless Signal Interference Field Surveys; Co-ordinated and assisted on Grouselodge Wind Farm Wireless Signal Interference Field Surveys Project; Calibration Modelling on Bruckana Wind Farm Wireless Signal Interference Field Surveys Project, Managed "self-help" re-transmitter installation for Athea Wind Farm Wireless Signal Interference Field Surveys Project, and completion of Carrickateane, Eglish, Crockdun Wind Farm Residential Broadband Desk-top software prediction modelling services and completion of TV, GSM and Broadband Interference Reports.

Karla Chagas, B.Eng., M.Sc. Electrical Engineering

Karla is a Software Engineer in Ai Bridges Ltd. with over 14 years' experience working in radar, telecommunications and radio related interference and telecommunications modelling projects, and over 4 years' experience working with aviation, telecommunications and EMI interference and remediation projects. She has received a M.Sc. in Electrical Engineering and is currently undertaking a Ph.D. in Computer Engineering.

Karla has participated in numerous cellular network planning projects for vendors/operators. Prominent telecommunications include Radar and IS2000 network designs. She worked as a research scholar at Virginia Tech's Alexandria Research Institute, where her research included optimisation of Wide-Area IEEE 802.11 Systems for Community Networks.

Relevant experience includes development of the 3D paging system prediction model for Aviation, 3G Broadband and EMI Interference Projects, development of a proprietary 3D model for TV Interference for analogue and digital terrestrial broadcast based on the ITUT standards, and development of the software prediction modelling on contract for UK, NI and Scotland Aviation and MET Radar Interference Analysis on FITS Wind Farm Project.

1.9.3 Chapter Structure

Each technical assessment included in the EIAR has followed the same general format:

- Assessment Methodology and Significance Criteria: A description of the methods used in baseline surveys and in the assessment of the significance of effects

- Baseline Description: A description of the Site's existing baseline, based on the results of surveys, desk information and consultations, and a summary of any information required for the assessment, that could not be obtained, if applicable
- Assessment of Potential Environmental Effects: A description of how the baseline environment could potentially be affected for the Development including a summary of the measures taken during the design of the Development to minimise effects
- Mitigation Measures and Residual Effects - A description of measures recommended that will be implemented to reduce and/or off-set potential negative effects and a summary of the assessed level significance of the effects of the Development and/or the Development after mitigation measures have been implemented
- Cumulative Effects: A description identifying the potential for effects of the Development to combine with those from other existing, pending and/or permitted developments to affect resources
- Statement of Significance of effects

The significance of effects resulting from the Development will be determined through consideration of a combination of the sensitivity of the receiving environment and the predicted level of change from the baseline state. Environmental sensitivity can be categorised by several aspects including factors such as; the transformation of natural landscapes, the protection afforded to, and presence of, European sites, rare or endangered species, land use and fisheries.

Sensitivity of classification of the receiving environment can vary between the different technical areas of assessment e.g., ecology, hydrology, population and human health and visual. In general, this EIAR largely follows the principles and terminology of the 2022, EPA 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' in relation to the identification of significant effects. Where a technical assessment has adopted an alternative to this process, such as following technical guidance bespoke to that topic, such assessment criteria are made clear in that chapter. **Table 1.4** highlights the general framework for the assessment of significance of effects.

Table 1.4: Impact Classification Terminology (EPA Guidelines, 2022)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible within normal bounds of variation or within the margin of forecasting error

Impact Characteristic	Term	Description
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An effect capable of measurement but without significant consequences
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
	Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
	Profound	An effect which obliterates sensitive characteristics
Extent & Context	Extent	Describe the size of the area, number of sites and the proportion of a population affected by an effect
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions
Probability	Likely	Effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
	Unlikely	Effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Duration and Frequency	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effect lasting over sixty years
	Reversible	Effects that can be undone, for example through remediation or restoration
	Frequency	Describe how often the effect will occur, (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)

Impact Characteristic	Term	Description
Type	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out
	'Worst Case'	The effects arising from a project in the case where mitigation measures substantially fail
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents

1.9.4 Turbine Parameters used for EIAR Assessments

The proposed range of turbine parameters are assessed within the impact assessment chapters of this EIAR (Chapters 4-17) and are presented on **Figure 1.4**. In this regard the European Commission "Guidance document on wind energy developments and EU nature legislation, (November 2020)[7] notes that:

"The key issue for a competent national authority to authorise a wind energy development project based on an envelope rather than a specific design relates to environmental impact. From an environmental impact perspective, the applicant must ensure that the EIA and the Appropriate Assessment undertaken has considered the worst-case design possible within the different options available in the design envelope."

Table 1.5 describes for each of the EIAR topics how the turbine range, which is set out in the below bullet points, has been assessed. It should be noted that the Natura Impact Statement (NIS) submitted has similarly assessed the proposed range of turbine parameters. The proposed range of turbine parameters is limited to a variation of 8 m in tip height and 6 m in rotor diameter.

[7] https://ec.europa.eu/environment/nature/natura2000/management/docs/wind_farms_en.pdf, accessed 17/09/2021

- Turbine Tip Height – Maximum height 185 metres, Minimum height 177 metres.
- Hub Height – Maximum height 110.5 metres, Minimum height 102.5 metres.
- Rotor Diameter - Maximum diameter 155 metres, Minimum diameter 149 metres.
- Turbine Foundations – Maximum diameter 25.5 metres, Minimum diameter 22 metres.

Table 1.5: EIAR Topics and Turbine Ranges Assessed

Chapter	Turbines Considered
Chapter 3 Alternatives Considered	This chapter provides a description of the reasonable alternatives studied by the Developer, and the main reasons for choosing the proposed project (which includes the Turbine Range), taking into account the effects of the proposed project on the environment.
Chapter 4 Population & Human Health	This chapter comprehensively assesses the potential effects of the Project on Population and Human Health (which includes the turbine range). The relevant Irish guidance for shadow flicker is derived from the 'Wind Energy Development Guidelines for Planning Authorities' (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012). The DoEHLG Guidelines state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Taking the above into consideration, JOD examined maps to identify receptors (dwellings) in the local area within a study area, a distance ten times the maximum proposed rotor diameter of the proposed turbines (10 x 155 m = 1,550 m). The maximum rotor diameter of 155 m was used to calculate this distance which was then rounded up to 2 km to ensure a conservative assessment. This dimension will give the most significant number of receptors and the largest study area. A specimen turbine was selected to model a base case scenario using the maximum possible rotor diameter and tip height. To ensure the full extent of the moving shadow which would be

Chapter	Turbines Considered
	created by the Turbine Range was assessed the following scenarios were modelled. These scenarios are appropriate to this assessment as they represent the full turbine range. • Specimen Turbine – 107.5 m hub, 155 m rotor diameter, 185 m tip height • Alternative Scenario 1 – 102.5 m hub, 155 m rotor diameter, 180 m tip height (lowest hub height and largest rotor diameter) • Alternative Scenario 2 – 110.5 m hub, 149 m rotor diameter, 185 m tip height (highest hub height and lowest rotor diameter) • Alternative Scenario 3 – 102.5 m hub (lowest hub), 149 m rotor diameter (shortest rotor), 177 m tip height
Chapter 5 Terrestrial Ecology	This chapter comprehensively assesses all scenarios and potential effects within the Turbine Range on terrestrial ecology. The potential impacts that could arise from the Project during the construction, operational and decommissioning phases were assessed, and it was found that there will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range. Habitat loss due to the extent of excavations required (30.75 ha) for the Project will differ depending on which turbine is chosen. However, the difference in effects is not seen as significant.
Chapter 6 Aquatic Ecology	This chapter comprehensively assesses all scenarios within the Turbine Range on Aquatic Ecology. The potential impacts that could arise from the Project during the construction, operational and decommissioning phases relate to the potential for increased suspended sediment concentrations associated with site preparation activities and excavations (77,262 m^3) for the infrastructure elements including the turbine foundations, cable trenches and watercourse crossings. There will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range because of the design phase mitigation measures which will be implemented prior to construction. All works will be outside of the 65 m buffer from watercourses and 20 m buffer from drains. Additionally, all temporary stockpiles will be at no less than

Chapter	Turbines Considered
	25 m from watercourses. This will be implemented regardless of the volume of excavated materials created as a result of the Turbine Range.
Chapter 7 Ornithology - Bird Collision Risk	This chapter comprehensively assesses all scenarios within the Turbine Range on Ornithology. The potential impacts that could arise from the Development during the construction, operational and decommissioning phases relate to the potential for increased collision risk for the Turbine Range. The Collision Risk Model has accounted for all scenarios within the Turbine Range.
Chapter 8 Soils & Geology	This chapter comprehensively assesses all scenarios within the Turbine Range on Soils and Geology. The potential impacts that could arise from the Project during the construction, operational and decommissioning phases relate to the potential for increased stability issues and suspended sediment concentrations associated with site preparation activities and excavations for the infrastructure elements including the turbine foundations and cable trenches (77,262 m^3) as detailed in **Appendix 2.1: Construction Environmental Management Plan.** The peat stability assessment has been completed on the basis of two scenarios: 1. Scenario A – Peat Stability in terms of the receiving environment as is, that is using the depth of peat observed and recorded during site surveys. 2. Scenario B – Peat stability in terms of the *in situ* peat with 1 m fill (presumed peat) placed on top, that is using the depth of peat observed and recorded during site surveys plus 1 m fill (depth + 1.0 m). This is the assessment worst case scenario and this will be used to assess stability at proposed infrastructure locations. There will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range as there is only a 3.5 m range in diameter of the wind Turbine Foundations to cater for all turbines within the Turbine Range. The

Chapter	Turbines Considered
	difference will be negligible in the assessment of potential effects of the Development on the environment. • Turbine Tip Height – Maximum height 185 metres, Minimum height 177 metres. • Hub Height – Maximum height 110.5 metres, Minimum height 102.5 metres. • Rotor Diameter - Maximum diameter 155 metres, Minimum diameter 149 metres. • Turbine Foundations – Maximum diameter 25.5 metres, Minimum diameter 22 metres.
Chapter 9 Hydrology and Hydrogeology	This chapter comprehensively assesses all scenarios within the Turbine Range on hydrology and hydrogeology. The potential impacts that could arise from the Project during the construction, operational and decommissioning phases relate to the potential for increased suspended sediment concentrations associated with site preparation activities and excavations for the infrastructure elements including the turbine foundations, cable trenches and watercourse crossings (77,262 m^3). There will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range because of the design phase mitigation measures which will be implemented prior to construction. All works will be outside of the 65 m buffer from watercourses and 20 m buffer from drains, where possible. Where this is not possible, additional mitigation measures such as increased use of Sustainable Drainage Systems (SuDS), will be implemented. Additionally, all temporary stockpiles will be at no less than 25 m from watercourses. This will be implemented regardless of the volume of excavated materials created as a result of the Turbine Range.
Chapter 10 Air & Climate	The assessment in this chapter considers an overall power output from the Project (which includes the Turbine Range) of between 28 MW to 33 MW. The Carbon Calculator, which is assessed for both the lower range (5.6 MW) and the higher range (6.6 MW), accounts for improvement works such as the habitat enhancement area and the years taken for the Site to return to its original characteristics.

Chapter	Turbines Considered
	Carbon Losses and Savings were calculated based on the lower and higher ranges of output to ensure all scenarios within the proposed range are assessed.
Chapter 11 Noise	This chapter comprehensively assesses all scenarios within the Turbine Range as well as all associated works. The 2006 Guidelines, ETSU-R-97 and the IOA Good Practice Guide recommend the measurement and use of wind speed data, against which background noise measurements are correlated. The IOA Good Practice Guide Supplementary Guidance Note 4[8] (Appendix 11.2) gives the methodology to account for wind shear, calculation to hub height and to standardise 10 m height wind speed. For this reason, the hub height was used to assess the potential effects of noise. A variation in hub height will not change the maximum sound power level of a turbine. However, a hub height wind speed of 110.5 m for the N149 when calculated to a 10 m height wind speed will give marginally different noise levels at the low wind speeds of 3 m/s and 4 m/s (10 m height) than if calculated from a hub height wind speed of 102.5 m. The marginal variation for the N149 is in the order giving lower levels of 0.8 dB at 3 m/s and 0.7 dB at 4 m/s for the hub height of 102.5 m. At 5 m/s (10 m height) and above the maximum sound power level does not change. A difference in sound power levels less than 1 dB are negligible to the human ear.
Chapter 12 Landscape & Visual Amenity	This chapter comprehensively assesses all scenarios within the Turbine Range as well as all associated works on the landscape and visual amenity. A specimen turbine and two alternative scenarios were included in the assessment in order to fully assess the range of turbine parameters.

[8] IOA, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise- Supplementary Guidance Note 4: Wind Shear

Chapter	Turbines Considered
	A specimen turbine was selected to model a base case scenario using the maximum possible rotor diameter and tip height. To ensure the full extent of the visual effects of the Development on the landscape, which would be created by the Turbine Range, the following scenarios were modelled. • Specimen Turbine – 107.5 m hub, 155 m rotor diameter, 185 m tip height (as used for the visual impact assessment herein) • Alternative Scenario 1 – 102.5 m hub, 155 m rotor diameter, 180 m tip height (lowest hub height, longest rotor diameter) • Alternative Scenario 2 – 110.5 m hub, 149 m rotor diameter, 185 m tip height (highest hub height, shortest rotor diameter) As the lower, middle and higher ranges that would have the most visual impact on the landscape have been assessed, all scenarios within the Turbine Range are assessed.
Chapter 13 Material Assets and Other Issues	This chapter comprehensively assesses the Project (which includes the Turbine Range) on material assets and other issues. For aviation, the tallest tip height (185 m) represents the largest obstacle of any turbine within the Turbine Range to air traffic (irrespective of the turbine selected and constructed within the Turbine Range, a turbine with an equal or lesser tip height will still be within that space). Similarly, for the telecoms assessment, the largest possible dimensions of a turbine selected and constructed within the Turbine Range (which is a 185 m tip and a 155 m rotor diameter) were assessed as this provided the largest obstacle to communication links (any other turbine selected and constructed will be within that space). In terms of utilities, there will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range.
Chapter 14 Cultural Heritage	This chapter comprehensively assesses all scenarios within the Turbine Range on Cultural Heritage. The potential impacts that could arise from the Project during the construction, operational and

Chapter	Turbines Considered
	decommissioning phases relate to the potential for increased ground disturbance associated with site preparation activities and excavations for the infrastructure elements including the Turbine Foundations. Turbine Foundations will range from 22 m in diameter to 25.5 m in diameter. With larger excavations for larger Turbine Foundations, the chances of finding unrecorded, subsurface archaeological features are higher. However, such features may also be found where a smaller Turbine Foundation is used. Therefore, there will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range. The setting impacts described in Chapter 14 will result from the presence of turbines within the wider environs of extant cultural heritage sites. The difference in dimensions within the Turbine Range will not result in a likely increased magnitude of impact on setting that would result in changes to predicted effects.
Chapter 15 Traffic and Transportation	This chapter comprehensively assesses the proposed project (which includes the Turbine Range). There is one element of this assessment for which the turbine dimensions are directly relevant (i.e., The maximum blade length of 76.8 m). The transport assessment considered the worst-case scenario in terms of works required to the turbine delivery route based on a maximum 76.8 m blade length. Regardless of which turbine is selected and constructed within the Turbine Range the scale and extent of accommodation works required on the public road will remain the same as the same turbine delivery truck and methodology will be applied across the range of rotor diameters and therefore the associated impacts remain the same.

Chapter	Turbines Considered
	It should also be noted there are no additional traffic movements arising irrespective of which turbine is selected and constructed within the Turbine Range.
Chapter 16 Major Accidents and Natural Disasters	There will be no change to the likelihood of major accidents or natural disasters irrespective of which turbine is selected within the Turbine Range.
Chapter 17 Interactions of the Foregoing	There will be no change to the potential impacts or predicted effects irrespective of which turbine is selected within the Turbine Range.

1.9.5 Significance Criteria

The significance of the potential effects of the Development have been classified by taking into account the sensitivity of receptors and the magnitude of the potential effect on them, combined with the likelihood of an impact occurring as defined in **Table 1.6**

Table 1.6: Rating of Significant Environmental Impacts (EPA Guidelines, 2022)

Description of Impact Character/Magnitude/Duration/Likelihood/Consequences					
Magnitude of Significance /Sensitivity		**Negligible**	**Low**	**Medium**	**High**
	Extremely High	Not Significant	Profound/ Very Significant	Profound	Profound
	Very High	Not Significant	Moderate	Significant	Profound/ Very Significant
	High	Not Significant	Slight	Significant/ Moderate	Very Significant
	Medium	Not Significant/ Imperceptible	Slight	Moderate	Significant/ Moderate
	Low	Imperceptible	Slight/ Not Significant	Slight	Slight/ Moderate
	Negligible	Imperceptible	Imperceptible	Imperceptible	Imperceptible

1.9.5.1 Mitigation Measures and Residual Effects

There are three established strategies for impact mitigation - avoidance, reduction and remedy. The efficacy of each is directly dependent on the stage in the design process at which environmental considerations are taken into account, (i.e., impact avoidance can only be considered at the earliest stage, while remedy may be the only option available for projects where avoidance and reduction were not possible).

The EIA co-ordinator has engaged with stakeholders, which has provided the benefit of developing and refining mitigation through an iterative process rather than 'adding on' such measures at the end of the Project. Mitigation measures have been prioritised and embedded into the design phase of the Development to avoid, reduce and offset any significant adverse effects. These are referred to within this EIAR as 'embedded mitigation'.

Relevant mitigation measures are discussed within each technical Chapter of this EIAR. **Chapter 17: Interactions of the Foregoing** provides a summary of mitigation measures for all technical assessments in **Appendix 17.1: Schedule of Mitigation Measures.**

1.9.5.2 Cumulative Effects

The potential cumulative impact of the Project has been assessed in line with Annex IV of the EIA Directive as amended which provides that the EIAR must contain a description of the likely significant effects of the project on the environment resulting from the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

The assessment of the Project in combination with other projects considers the range and nature of existing projects within the cumulative impact study area of the Project, as far as practically possible. For the purposes of this EIAR, a radius of 3 km from the Redline Boundary, 50 m either side of the Turbine Delivery Route and a radius of 20 km for larger scaled projects for landscape and visual impacts.

Projects with the potential for cumulative or in combination effects were identified and those which will neither directly or indirectly contribute to cumulative or in combination impacts (outside of 3 km from the Development) were screened out.

A summary of the relevant projects with potential to create cumulative impacts has been included in **Appendix 2.4** and detailed cumulative impact assessments are included in each relevant section of the EIAR.

The geographic extent of the cumulative assessment is considered on a case-by-case basis, in line with the following:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

- Guidance on the Preparation of the Environmental Impact Assessment Report (European Union 2017) (Directive 2011/92/EU as amended by 2014/52/EU); and
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999).

Assessment material for this cumulative impact appraisal was compiled based on relevant developments within 3 km of the Development, and 50 m either side of the length of the Grid Connection Route and Turbine Delivery Route lands.

For the purpose of Cumulative Assessment of Landscape and Visual, all existing and approved wind farms and wind farms pending a decision from the planning authority within 20 km from the outermost turbines of the Project were identified for Cumulative Visual Assessment. This study area is derived from the Wind Energy Development Guidelines (2006).

All existing and approved large-scale projects and large-scale projects pending a decision from a planning authority within 20 km of the Development were considered for potential Cumulative Assessment in all other chapters of this EIAR. This measurement was taken from the outermost turbines of the Development. A 20 km distance was considered appropriate due to the size and extent of the proposed wind farm and the nature of the potential effects as detailed throughout the EIAR.

All existing and approved projects and projects pending a decision from a planning authority within 50 m of the Grid Connection Route and Turbine Delivery Route lands were considered for potential Cumulative Assessment in all other chapters of this EIAR. A 50 m distance was considered appropriate due to the brief to temporary nature of the works involved and due to the limited extent of the works required.

The material for the cumulative assessment was gathered through a search of relevant County Councils' Online Planning Registers, the An Bord Pleanála website and the EIA Portal. Relevant EIA documents, planning application details and planning drawings were reviewed, which served to identify the locations of existing and approved projects and projects pending a decision from a planning authority, their activities and their environmental impacts.

The relevance of the projects was considered on a case-by-case basis in each chapter as necessary depending on the interaction and likelihood of in combination impacts. A full list of projects identified for cumulative assessment is set out in **Appendix 2.4**.

1.9.5.3 Statement of Significance of Effects

The statement of significance outlines the conclusion of each technical assessment in order to provide a final overall conclusion as to the significance of the Development under the terms of the EIA Directive 2011/92/EU (EIA Directive) and the 2014 EIA Directive 2014/52/EU (2014 EIA Directive).

1.10 SCOPING AND CONSULTATION

The scoping and consultation process was carried out in accordance with the EIA Directive and in accordance with the Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, May 2022).

The 2014 EIA Directive Circular (PL 05/2018)[9] notes that:

"It is a requirement of the EIA process to consult with statutory consultees and to take into account any submissions made by these consultees. Such submissions may contain expert specialist opinions on topics to be assessed in the EIA process…".

A consultation and scoping exercise were carried out in November 2020 and again in September 2022. **Table 1.7** documents individuals and organisations that have been consulted as part of the EIA process. The purpose of this consultation process was to provide a focus for the EIA by identifying the key issues of relevance. As such, the consultation process informs the various organisations of the Development, thereby providing an opportunity to submit comments and to offer information relevant to the preparation of this EIAR. Responses can be found in **Volume IV, Appendix 1.1: Consultation Responses.**

[9] Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, August 2018. Available online: https://www.opr.ie/wp-content/uploads/2019/08/2018-Environmental-Impact-Assessment-1.pdf [Accessed 22/07/2022]

Table 1.7: Scoping Responses Received on The Project

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
Cork County Council	A pre-planning meeting was held via Microsoft Teams on 14/01/2021 and 17/11/2022. A presentation was given outlining the project purpose, impact assessments carried out and the application process under Strategic Infrastructure Development guidelines. The main points of interest during the consultations included: • CDP objective HE2-3 Biodiversity outside protected areas and the Heritage Chapter as a whole	At the pre-planning meeting held via Microsoft Teams on 14/01/2021, a significantly different and larger scope of works was proposed to what was proposed at the meeting on 17/11/2022. All items raised were considered during the design and assessment processes. The study area of the Project was extended to approximately 2 km from the Redline Boundary for the checking of potential bat roosts. The underground grid connection route was also included in the study area. For the Turbine Delivery Route, an assessment was made of locations where physical works are required to facilitate the passing of the vehicles. The following frame of reference was used in determining the importance of ecological features identified during the desk study and surveys: -International and European -National (Ireland) -County (County Cork) -Local (lower value / higher value) -Site (wind farm immediate study area) The value of habitats has been measured against published selection criteria where available. The ecological evaluation and impact assessment approach used in this report is based on EPA Guidance (2022) and Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland ("CIEEM guidelines") (CIEEM, 2019) (Biodiversity is addressed in	**Ecology** addressed in Chapters 5 and 6 **Ornithology** addressed in Chapter 7 **Hydrology** addressed in Chapter 9 **Soils and Geology** addressed in Chapter 8 **Grid Connection Options** addressed in Chapter 3 **Landscape and Visual Amenity** addressed in Chapter 12 **Selected Grid Connection** assessed in Chapters 5-15

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	• Rationale for view point locations, suggested some additional viewing points from the new N22 would be of value	**Chapter 5: Terrestrial Ecology**, **Chapter 6: Aquatic Ecology** and **Chapter 7: Ornithology).** All of the scenic routes where the Zone of Theoretical Visibility (ZTV) indicates potential visibility were investigated during fieldwork to determine whether actual views of the Development might be afforded. Where visibility may occur, a viewpoint has been selected for use in the visual impact appraisal later in this chapter (**Chapter 12: Landscape and Visual Amenity**). A variety of receptor locations was also selected that are likely to provide views of the proposed wind farm from different distances, different angles and different contexts. The visual impact of a Development is assessed using up to 6 categories of receptor type as listed below: -Key Views (from features of national or international importance); -Designated Scenic Routes and Views; -Local Community views; -Centres of Population; -Major Routes; and -Amenity and heritage features The N22 is the only major route within the study area with any reasonable potential for visual impacts. As this route is a designated scenic route for the entire portion of the study area it is discussed in the context of scenic designations specifically in respect of View Points(VP19 and VP20).	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Taking into consideration consultation with Cork County Council regarding the N22 Ballyvourney Bypass, potential views from the new road alignment are considered. Viewing Point VP25 was selected for this purpose.	
	• Ecology unit identified some turbines they had concerns with.	Only one turbine, T1, will be constructed on habitats (wet heath/blanket bog) of significant ecological interest. This will result in the loss of 2 ha of wet heath/blanket bog . A Habitat Enhancement Area will be established as part of this Project to directly mitigate this effect., 11 ha of degraded blanket bog to the west of the Development will be rehabilitated as part of the enhancement area. The significance of the residual effect on wet heath/blanket bog is rated as a Moderate Adverse Effect of Long-term Duration. The other turbines and infrastructure are largely in commercial forest.	
	• Welcomed the stated approach to avoid bog	Blanket Bog and other Annex I habitats have been avoided where possible. This habitat is widespread in this part of the County. A habitat enhancement plan has been prepared and will be implemented to offset the impacts where these habitats have been lost (**Appendix 6.1 Habitat Enhancement Plan**).	
	• Welcomed distances achieved from residential units, in line with draft national guidelines.	There are 39 houses within 2 km of the proposed turbines. This can be seen in **Figure 1.3**. The closest property to a proposed turbine is 753 m	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		away from T2. All houses located within 2 km of the proposed turbines are shown in **Figure 1.3.** There are no inhabited dwellings contained within the specified setback distance of 740 m stated in the Draft Revised Wind Energy Development Guidelines (2019) based on the maximum proposed tip height of the turbines.	
	Following the pre-planning meeting Scoping Opinion was received on 22/01/2021. The main points were as follows: • The EIAR and construction practice and methodology should take into account existing ground conditions onsite and best practice. Disposal or elimination of waste/surplus material from construction/site clearance, particularly significant for peatland sites.	Existing ground conditions have been taken into consideration. A Site Investigation Report and Peat Stability Risk Assessment are included as **Appendix 8.1**. The estimated potential total volume of excavated material has been calculated in **Appendix 2.1 CEMP**, Management Plan 4: Peat and Spoil Management Plan. All excavated material apart from that along the Grid Connection Route will be reused onsite. The excavated material arising from the Grid Connection Route Construction will be removed to a licensed facility.	
	• Grid connection needs to be finalised - Should the grid connection not form part of the planning application, the EIAR should indicate the most likely corridor of the grid connection, its width and route and the likely nature of the connection in terms of	The grid connection is being assessed as part of the EIAR. However, planning permission is not being sought for the grid connection.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	line voltage, whether it will be underground (preferred) or over ground (including details of pole type) and any ancillary equipment (e.g., substations).	It is proposed to construct one 38kV electricity substation within the Site, as shown on Figure 2.2. This will provide a connection point between the wind farm and the grid connection point at the existing Ballyvouskill 220kV Substation. Electricity transmitted between the turbines and the substation on the Site will be at 20 kV. The width of a 38kV cable trench based on a trefoil formation will be 600 mm. The depth of the trench for 38kV cables is 1 m. The overall length of the grid connection between the substation and the existing 220 kV GIS substation (**Figure 1.2**) is 19.9 km, of which 1.3 km is within the Site. The remaining 18.6 km is located off-road and in third-party lands through the townlands of Inchamore, Derryreag, Derreenaling, Cummeenavrick, Glashacormick, Clydaghroe, Cummeennabuddoge and Caherdowney. The proposed grid connection will consist of underground 110 38 kV cables. This grid cable will pass through the townlands of, Derryreag, Cummeenavrick, Glashacormick, Clydaghroe, Cummeennabuddoge and Caherdowney. The Grid Connection Route and a summary of the activities are outlined in **Chapter 2: Project Description**. Assessment of all elements of the application for the construction of Inchamore Wind Farm including the Grid Connection Route are assessed in **Chapters 4-17**.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	Comments received from the Ecology Office in November 2022. The main points included:		
	o Potential for impact on sites designated or proposed to be designated for protection of biodiversity;	The layout of the Development has been designed to minimise the potential environmental effects of the wind farm while utilising the maximum energy yield from the Site's wind resource. Layout design constraints are outlined in Section 2.5.1 **Chapter 2: Project Design.**	
	o Potential for impact on habitats of high natural value; and	A habitat survey was carried out and has been included in **Chapter 5: Terrestrial Ecology**. Habitats of high natural value were only noted to exist in proximity to the proposed location of T1. Potential effects on all habitats surveyed have been assessed and mitigation measures have been recommended and will be implemented where necessary. A Residual Effect exists by the loss of wet heath/blanket bog habitat, which is rated as a Moderate Adverse Effect of Long-term Duration. However the loss of 2 ha of wet heath/blanket bog will be mitigated by the restoration and protection of 11 ha of degraded bog within the habitat enhancement area which is located directly adjacent to the site .	
	o Potential for impact on protected species.	Protected species at the Site have been identified and potential effects of the Project on these protected species such as Kerry Slug, bats, otter etc. have been assessed in **Chapter**	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		5: Terrestrial Ecology. Mitigation measures listed in this chapter will be implemented during the pre-construction, construction, operational and decommissioning phases of the Project. With mitigation, no significant impacts are predicted on protected species.	
	• With regard to bat activity, if commuting and foraging routes of bats relative to proposals could be presented and if these routes could also be presented respective of habitats on site including any habitat loss associated with the development.	The ecological study area encompasses the Project. A Zone of Influence (minimum 15 km radius) was also considered as part of the review of designated sites. Industry best practice/guidance will be used to avoid the potential impacts on bats. Bat activity surveys targeted a range of foraging and commuting habitats present within the study area and those associated with linear features such e.g., roadside margins (**Chapter 6: Biodiversity**). Bat roost inspection surveys identified trees, structures, dwellings etc where bat roosts may occur and also assessed the surrounding habitat for suitable commuting and foraging areas.	
	• It is generally recommended to avoid intact upland habitats, in particular peatland habitats when identifying appropriate sites for development of wind farms.	The heath/bog habitat mosaic in the western area of the site has been rated as of Significant at a County level. Losses will be mitigated through the significant addition of restored bog habitats **Appendix 6.1 Habitat Enhancement Plan (Chapter 6: Biodiversity)**, with the residual adverse effect reduced to Moderate significance of long term duration.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Given the upland nature of the proposed works at Inchamore predominantly located within upland peatland habitats with coniferous plantations, there will be no significant loss of bat foraging/commuting habitat such as woodland edge associated with the Development.	
	• Per above comments and based on constraints mapping, it is recommended that development is avoided within areas identified as: - 'largely intact upland blanket bog' and 'cutaway blanket bog with intact areas' located in proximity to turbine 3 and associated developable areas within the vicinity of these habitats; and - areas comprising of a 'Mosaic of Upland Blanket Bog and Wet Heath' in proximity to the developable area associated with turbine 1. • Potential for the project to give rise to negative effects on freshwater habitats and having particular regard to potential impacts on Fresh water pearl Mussel and Salmon. To this end, there should be a focus at design stage on providing for an appropriately designed surface water management system which minimises risk of release of	A constraints map has been prepared (**Figure 3.1**) as part of this EIAR. This was a key factor in deciding the area in which to develop the wind farm. Environmental sensitivities, such as sensitive habitats and watercourse buffer zones etc., dictate a large proportion of design constraints. The developable area, including the proposed locations for turbines and site infrastructure avoids largely intact upland blanket bog, wet heath and cutover bog.. Annex I habitats have been avoided where possible. The habitat enhancement plan has been prepared and will be implemented to offset the effects where these habitats have been lost (**Appendix 6.1 Habitat Enhancement Plan**). Mitigation measures for the construction, operational, and decommissioning phases are embedded in Chapter 5: **Terrestrial Ecology, Chapter 6: Aquatic Ecology** and **Chapter 7: Ornithology**. Included in the design is an appropriately designed surface water management system, which minimises risk of	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	contaminants to surface waters and ensures that there is no increase in surface water run-off from the site. Avoidance of disturbance of peat based habitats will greatly assist with this.	release of contaminants to surface waters and ensures that there is no increase in surface water run-off from the site. The **Surface Water Management Plan (Appendix 2.1)** details the site drainage that has been designed for the site using the principles of Sustainable Drainage Systems (SuDS). The drainage system for the Development is designed in a manner to ensure there are no changes to the baseline water quality within or downstream of the Site. A comprehensive suite of drainage measures have been developed to protect all receiving waters from potential impacts during the construction, operation and decommissioning of the Development in the catchment of the Site and along the proposed Grid Connection Route. The assessment and associated proposed mitigation measures are in **Chapter 6: Aquatic Ecology** and **Chapter 9: Hydrology and Hydrogeology**. The Peat Stability Assessment Risk Ranking ranged from 'Very Low with isolated pockets associated with localised elevated stability risk' to 'Moderate'. The risk of peat-slide is further addressed in **Chapter 8: Soils and Geology**.	
	• Any species specific surveys which are deemed to be required including bird surveys must be completed by qualified and experienced practitioners following recognised best practise	All aquatic, terrestrial, and ornithological surveys were undertaken by qualified and experienced professionals following best practice methods. Details of surveyor qualifications and experience	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	methods. It should be noted that up to two years' full season surveys are required for certain bird species should a potential impact on any such species be identified as a possible risk having regard to reference.	and accompanying best practice methods followed are described in **Chapter 5: Terrestrial Ecology, 6: Aquatic Ecology,** and **7: Ornithology.**	
	• Decommissioning and reinstatement should be considered in detail and shall include opportunities for biodiversity enhancement where possible.	Detailed decommissioning works are provided in the Decommissioning Plan (**Appendix 2.1**). Following expert ecological guidance, natural succession will be allowed to prevail post the decommissioning period i.e., post removal of turbines. The Habitat Enhancement Plan will allow for the restoration of Annex I habitats that have been degraded by over-grazing. It is anticipated that various species of flora and fauna will utilise the area as the habitats are rehabilitated and improve in quality. The objectives for this plan are achievable as similar work has been carried out successfully at other sites throughout Ireland.	
Kerry County Council PLANNING & DEVELOPMENT SECTION 6 JUN 2023 646 KERRY COUNTY COUNCIL	Response received 26/08/2021. The observations/comments by the area planner to the Grid Connection and Turbine Delivery Route for the Development which are located within in County Kerry. are as follows: Environmental Impact Assessment. Appropriate Assessment. Archaeology assessments are all required.	The Grid Connection Route and the Turbine Delivery Route for the Project have been assessed as part of the EIAR. They are also assessed in the Natura Impact Statement prepared for this Project.	**Ecology** addressed in Chapters 5 and 6 **Ornithology** addressed in Chapter 7 **Hydrology** addressed in Chapter 9 **Soils and Geology** addressed in Chapter 8 **Grid Connection Options** addressed in Chapters 3
	Transport Infrastructure Ireland/N22 implications to be assessed. Area is zoned Secondary Special Amenity in the County Development Plan.	Transport Infrastructure Ireland have been consulted and a Road Safety Audit has been prepared as part of the Project. Please see **Chapter 15: Traffic and Transportation** for more details.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	It should be noted that the Site (of the grid connection works and Turbine Delivery Route works in Co. Kerry) is outside of the area zoned as "open to consideration" in the Renewable Energy Strategy. A pre-planning meeting was held via Microsoft Teams on 03/11/2022. From that meeting, Fiona O'Sullivan (Killarney Area Planner) noted the following: • the applicant is to submit an EIAR and AA Screening Report, • Regarding the EIAR - the applicant should include an ecological impact assessment on terrestrial and aquatic habitats and protected species, if applicable, identified. All supporting survey work should be undertaken to current best practices with competencies of staff outlined. Please consult with IFI and NPWS as applicable, • Regarding likely significant effects on European sites, I note the application is outside of European Sites but upstream of the Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment cSAC and in proximity to other European sites including those designated for birds of SCI,	Additionally, a Planning and Policy Statement has been included as part of the planning application. It is noted that elements of the Project (i.e., Sections of the Grid Connection Route and sections of Site Access Road and nodes of off-site roads) are within County Kerry and as such, a separate planning application has been prepared for such works and has been issued to Kerry County Council (Planning Authority). An Environmental Impact Assessment Report, Appropriate Assessment Screening Report and Natura Impact Statement have been prepared as part of this application. The potential effects of the Project on terrestrial ecology (**Chapter 5: Terrestrial Ecology**), aquatic ecology (**Chapter 6: Aquatic Ecology**) and ornithology (**Chapter 7: Ornithology**) have been assessed. This includes designated areas of ecological importance. All survey work has been carried out under best practice by competent experts. Please see the relevant chapters for details. Potential sensitive receptors have been identified and the likelihood and significance of potential effects on European sites have been assessed in the Natura Impact Statement which accompanies this planning application.	**Landscape and Visual Amenity** addressed in Chapter 12 **Cultural Heritage** Addressed in Chapter 14 **Selected Grid Connection** assessed in Chapters 5-15 **Chapter 15: Traffic and Transportation**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	• As the applicant is no doubt aware, any measures intended to avoid or reduce harmful effects on European sites should not be included at screening stage,	Mitigation measures intended to avoid or reduce harmful effects on European sites as a result of this Project have not been considered at screening stage.	
	• Any ornithology surveys should be robust and supported by at least 1 year of winter and breeding survey undertaken to concurrent best practices, • Likely impacts on White Tailed Sea Eagle should be specifically assessed, advisable to consult with NPWS in relation to same and note mitigation provided in the recently adopted Kerry County Development Plan for mitigation of any likely impacts on the species. • The application should include and assess all in-combination/accumulative effects of all elements of the project (grid connection etc) and/or other projects in the environs of the proposed development. • The Planning Report should clearly outline that this application forms part of a larger proposed development and details should be given of the application submitted to Cork Co Co.	Robust ornithology surveys have been completed and are detailed in **Chapter 7: Ornithology**. The potential effects on White Tailed Sea Eagle from the Development have been assessed in **Chapter 7: Ornithology**. National Parks and Wildlife Service have been consulted with at the scoping stage of this application and responses can be seen within this Table. The EIAR has assessed the cumulative impact of the Project on the various specific subject chapters. Please see the relevant effects assessed in each of the EIAR assessment chapters as prepared by the relevant experts. The EIAR has introduced the Project Description in Section 1.5 and also in **Chapter 2: Project Description.**	
Minister for Housing, Planning and Local Government	No response received	n/a	n/a
Aviation			
Cork Airport	No response received	n/a	n/a

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
IAA	Scoping response received 17th December 2020. The main points were as follows: • Contact Kerry Airport and request to assess whether a preliminary screening assessment is required • In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: o Agree an aeronautical obstacle warning light scheme for the wind farm development o Provide as-constructed coordinates in WGS84 format together with round and tip height elevations at each wind turbine location	Kerry Airport were contacted on 12th November 2020, 22nd November 2022 and 13th February 2023.. A response was received on 8th March 2023. In the event that planning permission is granted for the Project, the Irish Aviation Authority will be contacted prior to the commencement of any works for consultation. All items considered during the design process. No implications for the EIA/Design	**Aviation** discussed in **Chapter 13 Material Assets** An Aviation impact Assessment is included as **Appendix 13.3.**
Kerry Airport	Kerry Airport were contacted on 12th November 2020, 22nd November 2022 and 13th February 2023. A response was received on 8th March 2023. From an initial review the development would appear to be outside Kerry Airports 15 km OLS area. However, as you have highlighted in your scoping document section 4.2, the development has potential to impact on aviation coverage, and as such I would recommend that this be investigated further to confirm the development will not impact on the safe operation of aircraft and maintain current aviation associated coverage such as radio, radar, navigational aids etc. The requirements for lighting and inclusion of the structures on associated maps etc. will I am sure be addressed by the IAA. Further correspondence received on 18th April 2023 included:	Communication specialists, Ai Bridges were commissioned to undertake an aviation impact assessment of the operational phase of the Project, which is attached as **Appendix 13.3.**	**Aviation** discussed in **Chapter 13 Material Assets** An Aviation impact Assessment is included as **Appendix 13.3.**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	For the assessment report (Appendix 13.3) 1. Section 2.2 as the proposed development penetrates the Annex 15 Aerodrome surfaces, the developer must ensure the development does not impact or increase current published operating minima associated with Kerry Airport. 2. Section 2.3 MSA's- any development must ensure that there is no impact on the current published MSA's associated with Kerry Airport. 3. Section 2.8- Obstacle warning lights- the developer should liaise with the Aviation Authority to ensure that the development is included on maps and lighted in the interest of aviation safeguarding. 4. The assessment and planning should include the assessment of the construction phase as part of planning to ensure cranes or other equipment involved in the development do not impact on Aviation safety during the construction phase.	1. The development does not impact or increase current published operating minima associated with Kerry Airport. 2. There is no impact on the current published MSA's associated with Kerry Airport. 3. The Aviation Authority has been consulted with regarding aviation safeguarding and their response has been included in this table. 4. The construction phase has been assessed and the Development will not impact on aviation safety.	
Ecology			
An Taisce	No response has been received.	n/a	n/a
Development Applications Unit,	Scoping response received 19th April 2021. The main points were as follows:	All items considered during the design process. No further implications for the EIA/Design	**Aquatic Ecology** addressed in Chapter 6 **Ornithology** addressed in Chapter 7 **Hydrology** addressed in Chapter 8 **Soils and Geology** addressed in Chapter 9
	The proposed wind farm is within the catchment of the River Sullane, which, in addition to fish species of conservation importance (please consult Inland Fisheries Ireland for scoping), contains a population of the freshwater pearl mussel. The (high) water quality requirements of this species should be taken into account in designing siltation control measures. The	Inland Fisheries Ireland were consulted and a Scoping Opinion was received 23/11/2020 and a pre-planning meeting was held via Microsoft Teams 08/01/2021. Please see response to the scoping opinion below in this Table.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	combination of clean water diversion, lined multicelled stone-constructed sediment ponds which can be cleaned by suction rather than excavated out, an environmental management plan, alarmed autosamplers, and previous best-practice upland construction experience indicates that a sediment control system could control sediment release such that it will not have an adverse effect on freshwater life downstream.	Inland Fisheries Ireland will be consulted with again prior to the commencement of any construction activities. Potential effects of the Development on aquatic life have been assessed in **Chapter 6: Aquatic Ecology** while water quality has been further assessed in **Chapter 9: Hydrology and Hydrogeology**. A Surface Water Management Plan and a Water Quality Management Plan have been prepared as part of **Appendix 2.1 Construction Environmental Management Plan, Chapter 2: Project Description**. Sustainable Drainage Systems (SuDS) have been included in the design phase of the Project.	**Landscape and Visual Amenity** addressed in Chapter 12 **Drainage Design** is addressed in the CEMP
	3. In connection with the above also, a thorough geotechnical stability risk and hydrogeological assessment needs to be carried out of areas of relatively deep peat soil, not just for turbine foundations, but also for access roads, borrow pits, drains, etc. There are a number of cases of peat slides during upland wind farm construction, and the scientific investigations of the causes of these should be taken into account in the EIAR.	A comprehensive geotechnical stability risk and hydrogeological assessment have been carried out at proposed turbine locations, access roads, drains and borrow pit areas, as part of the preparation of this EIAR. A Peat and Spoil Management Plan (Management Plan 4) has been included as part of Appendix 2.1: Construction Environmental Management Plan, **Chapter 2: Project Description**. A Peat Slide Risk Assessment has been appended to **Chapter 8: Soils and Geology** as Appendix 8.1 PSRA and has been fully assessed in the chapter. An Emergency Response Plan has also been prepared as part of Appendix 2.1: CEMP, **Chapter 2: Project Description** and **Chapter**	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		16: Major Accidents and Natural Disasters also assesses the impact of peat slippage.	
	4. Other protected species that require species-appropriate survey methods following published best practice are (a) red grouse, (b) merlin, (c) hen harrier, (d) golden plover, (e) curlew (f) Leisler's bat, (g) Kerry slug and (h) marsh fritillary. For red grouse, the long-term effect of increased human access (on foot, motorbike or ORV) via roadways (and potentially fox access), as well as increased perches and food for hooded crows, needs to be considered in terms of the likelihood of increased predation on this species. Note that both merlin and roosting hen harrier are often difficult to detect, and have been underestimated previously in some EIARs, so experienced observers are recommended. Golden plover must be taken into account in cumulative assessment with other wind farms in the Cork/Kerry Mountains. Leisler's bat may be more susceptible to collision or baro-trauma, so turbine locations which overlap with feeding features need to be taken into account. A licence application for addressing any direct impacts on Kerry slug habitat may be necessary. Marsh fritillary may not be present in suitable habitat every year due to their metapopulation dynamics, so suitable habitat should also be recorded (as mentioned on page 6 of the Scoping Report).	All species mentioned were surveyed for following published best practice. Potential effects on these species as a result of the Development are assessed in **Chapter 5: Terrestrial Ecology** and **Chapter 7: Ornithology**. PLANNING & DEVELOPMENT SECTION 6 JUN 2023 646 KERRY COUNTY COUNCIL	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	5. There are a few upland protected plant species (including mosses and liverworts – see Statutory Instrument. No. 356 of 2015, Flora Protection Order) which need to be surveyed for, if or where suitable habitat exists in the development footprint. The discovery of the small cudweed (*Filago minima*) is mentioned in the Scoping Report, and it needs to be established if this can be avoided by the development. 6. It is now well established that climate change is likely to have a considerable impact on biodiversity and wildlife, due to droughts, floods, sea level rise, changes in seasonal weather, etc. The impact of CO2 emissions from extensive peat excavation, if this is to be carried out, needs to be fully accounted. 7. Impacts from associated works: (a) The likelihood of increases in nutrient loading of the River Sullane from forestry felling should also be assessed; (b) The effect of haul road widening and bridge upgrade works on protected species (e.g. otter, Kerry slug, Daubenton's and other bat species) should also be assessed; (c) if underground cables are to transport electricity, then river/stream crossings need to be examined, especially if in designated rivers; (d) effects of any fencing, lattice anemometer towers, etc., on red grouse collisions should be assessed.	Site surveys were completed to identify upland protected plant species. Potential effects on the identified protected plant species (*Filago minima*) as a result of the Development have been assessed in **Chapter 5: Terrestrial Ecology**. Mitigation measures will be implemented to prevent potential effects on *Filago minima*. A carbon calculation has been completed as part of this EIAR. This is detailed in **Chapter 10: Air and Climate**. a. The likelihood and significance of nutrient loading on watercourses as a result of forestry felling activities at the Development has been assessed in **Chapter 9: Hydrology and Hydrogeology**. A monitoring plan will be implemented as part of the Project. b. The effect of haul road widening and bridge upgrade works on protected species (e.g. otter, Kerry slug, Daubenton's and other bat species) have been assessed in **Chapter 5: Terrestrial Ecology**. c. **Chapter 9: Hydrology and Hydrogeology** assesses the impact of crossings on water quality. d. Potential effects of any fencing, lattice anemometer towers, etc., on red grouse collisions is assessed in **Chapter 7: Ornithology**. A Collision Risk Model	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		(CRM) has been included in this assessment.	
	8. The focus on habitats of conservation importance which are not protected, in the Scoping Report (page 6), is welcome. It should be kept in mind that some external funding agencies at European or global level are now expecting no net loss of biodiversity as part of their funding requirements. 9. The visibility of the turbines from Killarney National Park, although not an ecological issue, needs to be assessed elsewhere in the EIAR. 10. Section 3.6 refers to assessment of ornithological impacts during construction and operation. Assessment of decommissioning, because of its often-similar disturbance effects to construction, should also be assessed. 11. Finally, reliance on post-planning approval of detailed works (e.g., river crossings), and monitoring design, by the National Parks and Wildlife Service (NPWS) of the Department, should be avoided as (a) it may indicate inadequacies of assessment by the EIAR, and (b) staff may not be available to support this in the time frame of an active construction project.	A Habitat Enhancement Plan (**Appendix 5.5** of **Chapter 5: Terrestrial Ecology**) has been prepared as part of this EIAR to counter any potential loss of habitat as a result of the Development. The visibility of the turbines has been assessed in **Chapter 12: Landscape and Visual**. Potential effects during the decommissioning phase of the Project have been assessed in all technical chapters of the EIAR. In addition to this, a Decommissioning Plan has been prepared as part of **Appendix 2.1: Construction Environmental Management Plan**. Reliance on post-planning approval of detailed works (e.g., river crossings), and monitoring design, by the National Parks and Wildlife Service (NPWS) of the Department has been avoided.	
Bat Conservation Ireland	No response received.	n/a	n/a
Birdwatch Ireland	Acknowledgement of Scoping Receipt (17/11/2020) No response received.	n/a	n/a
Irish Wildlife Trust	Response received (16/02/2021) stating they did not have the capacity to respond right now. Follow up	n/a	n/a

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	communication was made between the Applicant and Irish Wildlife Trust but no response was provided.		
Soils and Water			
Geological Survey of Ireland	Scoping response received 20/11/2020 and include the following comments: • Geoheritage: Records show there are no unaudited County Geological Site (CGS) in the vicinity of the proposed development.	Consultation with available maps (GSI) indicates that there are no recorded 'Geoheritage' sites located within the redline boundary of the Site or within the near vicinity. All items considered during the design process. No implications for the EIA/Design	**Chapter 8: Soils and Geology**
	• Groundwater: The Groundwater Vulnerability map indicates the proposed wind farm area is of variable vulnerability. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' which can be used to inform appropriate mitigation measures.	Consultation with the GSI Groundwater Map Viewer (2022) indicates that the Wind Farm Site is underlain by areas classified predominantly mapped as 'Extreme (E)' vulnerability rating which tend to be at lower elevations, with some areas mapped as 'Rock at or Near Surface (X)' vulnerability rating particularly at higher elevations. Both the Turbine Delivery Route and Grid Connection Route traverse land with groundwater vulnerability ratings ranging from 'Moderately Vulnerable' to 'Extreme Vulnerability' (**Figure 9.9a – Groundwater Vulnerability**).	**Chapter 9: Hydrology and Hydrogeology**
	• Geological Mapping: Geological Survey Ireland (GSI) maintains online datasets of bedrock and subsoils geological mapping that is reliable, accessible and meets the requirements of all users including depth to bedrock and physiographic maps and the GSI encourages the use of these.	Consultation with the Geological Survey Ireland online data sets as well as site visits were carried out.	**Chapter 8: Soils and Geology**
	• Geohazards: Landslide susceptibility in the area of the proposed wind farm is variable and is classed from Moderately Low / Moderately High to High.	Peat and slope stability investigations at the Site (**Appendix 8.1**) indicate that the Site has a generally low risk probability with respect to peat	**Chapter 8: Soils and Geology**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		slippage and slope failure under the footprint of the Development. Considering the assessment conclusions are related to the Development and construction activities including vehicular movements will be limited to the Development, areas of potentially high risk (Geohazards, for example, GSI high risk landslide susceptibility) in terms of peat and slope stability will be avoided.	
	• Natural Resources (Mineral / Aggregates): In keeping with a sustainable approach, we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the proposed development are sustainably sourced from properly recognised and licensed facilities.	GSI data and map viewers have been consulted in the preparation of this EIAR. Imported stone will be from licensed facilities, as discussed in **Chapter 15: Traffic and Transportation**.	**Chapter 15: Traffic and Transportation**
Inland Fisheries Ireland	Scoping Opinion received 23/11/2020 and pre-planning meeting via Microsoft Teams 08/01/2021. The following comments were made: • There should be no drainage or other physical interference with the bed or bank of any watercourse without prior consultation with IFI.	All items considered during the design process and IFI will be consulted prior to any construction works. IFI will be consulted with prior to any works commencing on the Development. All water crossings as part of the Development will be clear span bridges and will avoid permanent disruption to the stream beds and banks, protecting fishery habitats. There will be 113 No. culvert crossings and three watercourse/bridge crossings will occur along the Grid Connection Route as part of the Project. This is further detailed in **Chapter 2: Project Description.**	**Ecology** addressed in Chapter 6 **Hydrology and Hydrogeology** addressed in Chapter 9 **Soils and Geology** addressed in Chapter 8

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		The original slope of the riverbank will be maintained with no sudden drops on the downstream side. Design details on the proposed clear span bridges (three (3 No.)) have been included in the Planning Drawings and have been assessed in the EIAR.	
	• Suspended solids and or hydrocarbon contaminated site run-off waters must be controlled adequately so that no pollution of surface waters can occur.	All site drainage will be directed through either sediment traps, settlement ponds and/or buffered drainage outfalls to ensure that total suspended solid levels in all waters discharging to any watercourse will not exceed 25 mg/L. This is detailed in **Chapter 2: Project Description** and **Chapter 9 Hydrology and Hydrogeology.** Construction phase drainage proposed can be seen in the Surface Water Management Plan as part of **Appendix 2.1 Construction Environmental Management Plan.**	**Chapter 2: project Description** **Chapter 9: Hydrology and Hydrogeology** **Appendix 2.1 CEMP, Management Plan 2 Surface Water Management Plan**
	• The following issues should be addressed o Identifying and zoning the project for environmental impact should a peat slip occur o Setting out contingency plan should a peat movement occur. o Setting out a plan for the control of silt in such a scenario, including measures to be put in place at the initial stages of construction.	The design of the Project has taken into consideration the depth of peat and angle of slope onsite. A constraints study was completed to provide a developable area. This is discussed in **Chapter 3: Alternatives Considered.** A Peat Slide Risk Assessment was carried out and can be seen as **Appendix 8.1** of **Chapter 8: Soils and Geology.** An Emergency Response Plan has been prepared as part of **Appendix 2.1:**	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Construction Environmental Management Plan (Management Plan 1). Emergency procedures in the case of the unlikely movement of peat have also been included in **Chapter 8: Soils and Geology**. Construction phase drainage proposed can be seen in the Surface Water Management Plan as part of **Appendix 2.1 Construction Environmental Management Plan**.	
	• In the event of any watercourse crossings being bridged or culverted the following general criteria should apply, o The free passage of fish must not be obstructed. o The original slope of the river bed should be maintained with no sudden drops on the downstream side. Design details on any proposed crossing should be incorporated at planning stage o Bridges are preferable to culverts.	All water crossings as part of the Development will be clear span bridges and will avoid permanent disruption to the stream beds and banks, protecting fishery habitats. There will be 113 No. culvert crossings and three watercourse/bridge crossings will occur along the Grid Connection Route as part of the Project. This is further detailed in **Chapter 2: Project Description**. The original slope of the riverbank will be maintained with no sudden drops on the downstream side. Design details on the proposed clear span bridges (three (3 No.)) have been included in the Planning Drawings and have been assessed in the EIAR.	**Chapter 2: Project Description** **Appendix 2.1: CEMP, Management Plan 2: Water Quality Management Plan** **Appendix 2.1: CEMP, Management Plan 3: Surface Water Management Plan** **Chapter 6 Aquatic Ecology** **Chapter 9: Hydrology and Hydrogeology**
	All instream works should be carried out only in the May-September period.	All instream works will be carried out during the period of May to September only.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
Irish Peatland Conservation Council	Scoping response received 15/02/2021 stating they had no comments to make at this time.	n/a	n/a
Telecommunications			
Broadcasting Authority of Ireland	Scoping response received 16/11/2020 and made the following comment: The BAI does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, we are not aware of any issues from the existing windfarms into existing FM networks. Also, the proposed windfarms are not located close to any existing or planned FM transmission sites.	No implications for the EIA/Design	n/a
Eir Limited	Scoping response received 27/11/2020 stating there should be no impact on the eircom Ltd microwave radio network.	No implications for the EIA/Design	Radio link discussed in Chapter 13
ENET	Scoping response received 19/02/2021 highlighting the ENET link near the proposed turbines.	All items considered during the design process. No implications for the EIA/Design.	**Telecommunications** discussed in **Chapter 13: Material Assets** and **Chapter 3: Alternatives Considered**
RTÉ	Scoping response received 17/11/2020 highlighting that there was a risk of interference to DTT viewers receiving from the Mullaghanish site. Several pre-planning meetings were held with 2RN (trading name of RTÉ) on behalf of RTÉ to discuss the existing links and minimum buffers required.	Telecommunications specialist (Al Bridges) was employed to inform the turbine layout to minimise impact to existing links.	**Telecommunications** discussed in **Chapter 13: Material Assets**
Tetra Ireland	Scoping response received 09/12/2020 stating no impact from the development was anticipated.	No implications for the EIA/Design	n/a
Three Ireland (Hutchison) Limited	No response received	n/a	n/a

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
Virgin Media Television	Scoping response received 16/11/2020 and stated Virgin Media does not have any record of underground services at this location.	No implications for the EIA/Design	n/a
Vodafone	Scoping response received 15/02/2021 highlighting the links that will be effected by the proposed development.	Telecommunications specialist (Al Bridges) was employed to inform the turbine layout to minimise impact to existing links.	**Telecommunications** discussed in **Chapter 13: Material Assets**
Other			
Commission for Communications Regulation	No response received	n/a	n/a
Department of Agriculture	No response received	n/a	n/a
Department of Defence	Scoping response received 08/12/2020 and included the following points: • In all locations where wind farms are permitted it should be a condition that they meet the following lighting requirements:	All items considered during the design process. No implications for the EIA/Design	**Aviation** discussed in Chapter 13
	• Single turbines or structures, or turbine delineating corners of a wind farm should be illuminated by high intensity obstacle lights.	High intensity obstacle lighting will be used on selected turbines within the Development.	
	o Obstruction lighting elsewhere in a wind farm will be of a pattern that will allow the hazard to be identified and avoided by aircraft in flight.	Obstruction lighting elsewhere in the wind farm will be of a pattern that will allow the hazard to be identified and avoided by aircraft in flight.	
	• Construction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.	Construction lights used will be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles will emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (nm) of wavelength. Light intensity will be of similar value to that emitted in the visible spectrum of light.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
Department of Transport, Tourism and Sport	• Scoping response received 26/11/2020 and includes the following points:	All items considered during the design process. No implications for the EIA/Design	**Alternatives Considered** discussed in Chapter 3 **Traffic and Transport** discussed in Chapter 15
	• The EIAR should include information on what impact the proposed development may have on the public road network both during construction and in the longer term.	**Chapter 15: Traffic and Transportation** of the EIAR and **Management Plan 7, Traffic Management Plan** of **Appendix 2.1: Construction Environmental Management Plan** includes information on what impact the proposed development may have on the public road network both during construction and in the longer term.	**Chapter 15: Traffic and Transportation** **Appendix 2.1: CEMP**
	• The EIAR should indicate whether it is proposed to use public roads to connect the windfarm to the grid and if that is the case specify the extent of the works required including drainage, diversions, relocation of services and road re-instatement.	**Chapter 2: Project Description** details the extent of works relating to the Grid Connection Network within the public road infrastructure. Please also see **Appendix 2.4: Grid Connection Details**.	**Chapter 2: Project Description** **Appendix 2.4: Grid Connection Details**
	• The EIAR should also address the future maintenance requirements related to the installation of the cables in public roads and the cost implications for the relevant local authority. Consideration should also be given to how cabling needs to be organised and, where a number of cables are envisaged from existing, approved and proposed developments, rationalised into one cable or a group of cables in one trench in order to minimise the impacts on the road network and the environment along the road boundary (hedgerows).	All items considered during the design process. No implications for the EIA/Design. The only instance in which cables will be installed in public roads is via directional drilling under the N22 and therefore, the road surface will not be disturbed and there will be no requirement for future maintenance by the local authority. All items considered during the design process. No implications for the EIA/Design **Chapter 2: Project Description** details the extent of works relating to the Grid Connection Network within the public road infrastructure. Please also see **Appendix 2.4: Grid Connection Details**.**Chapter 15: Traffic and**	**Chapter 2: Project Description** **Appendix 2.4: Grid Connection Details** **Chapter 5: Terrestrial Ecology**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Transportation of the EIAR and **Management Plan 7, Traffic Management Plan** of **Appendix 2.1: Construction Environmental Management Plan** includes information on what impact the proposed development may have on the public road network both during construction and in the longer term.	
	• In addition the EIAR should consider the possibility of over-ground solutions for the transmission of electricity as an alternative.	All items considered during the design process. No implications for the EIA/Design **Chapter 2: Project Description** details the extent of works relating to the Grid Connection Network within the public road infrastructure. Please also see **Appendix 2.4: Grid Connection Details**.	**Appendix 2.4: Grid Connection Details** **Chapter 3: Alternatives Considered**
Environmental Protection Agency	Acknowledgement of Scoping Receipt (13/11/2021)	n/a	n/a
Fáilte Ireland	Scoping response received 23/11/2020 and includes the following points:	All items considered during the design process.	Addressed in Chapters 2-16 – Tourism is addressed specifically in **Chapter 4: Population and Human Health**
	• Project descriptions are required to describe the location of the project, the physical characteristics of the whole project, the main characteristics of the operational phase of the project and an estimate, by type and quantity, of the expected residues and emissions. The location of the project should include identifying key sensitive receptors (including tourism receptors). In the operational phase of the project any tourism based, or potentially tourism related activity, should be identified.	A description of the location of the project, the physical characteristics of the whole project can be found in **Chapter 2: Project Description** and has been summarised and assessed in full in each chapter of the EIAR. The main characteristics of the operational phase of the project have been summarised throughout the EIAR and an estimate, by type and quantity, of the expected residues and	**Chapter 2: Project Description** **Chapter 4: Population and Human Health** **Chapter 13: Material Assets**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		emissions has been included in **Chapter 13: Material Assets** and **Chapter 10: Air and Climate.** Key human sensitive receptors (including tourism receptors) have been identified in **Chapter 4: Population and Human Health.**	**Chapter 10: Air and Climate**
	• Detail the key considerations culminating in the selection of the design, the reasoning for these and the environmental effect of these decisions. The developer is expected to consider reasonable alternatives. What is considered reasonable may vary from case to case.	Cumulative effects have been assessed throughout the entire EIAR. Cumulative effects in relation to tourism have been included in **Chapter 4: Population and Human Health.** Reasonable alternatives have been considered in the design of the Project as detailed in **Chapter 3: Alternatives Considered.**	**Chapter 3: Alternatives Considered** **Chapter 4: Population and Human Health**
	• Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependent on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the Draft Guidelines. These characteristics apply to both the development and the environment.	All items considered during the design process. No implications for the EIA/Design. Tourism receptors have been identified and have been assessed in **Chapter 4: Population and Human Health** and **Chapter 13: Material Assets.**	**Chapter 4: Population and Human Health**
	• Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the Draft Guidelines and includes the **quality, significance, extent, probability, type** and **duration** of the effect, with particular descriptors for each. Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism assets under the 'material assets' topic below.	All items have been considered and addressed throughout the EIAR. Tourism has been assessed in **Chapter 4: Population and Human Health** and **Chapter 13: Material Assets.**	**Chapter 4: Population and Human Health** **Chapter 13: Material Assets**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	• The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section.	All items have been considered and addressed throughout the EIAR. Tourism has been assessed in **Chapter 4: Population and Human Health** and **Chapter 13: Material Assets**.	**Chapter 4: Population and Human Health** **Chapter 13: Material Assets**
	• The disturbance to ecology must be managed to minimise impact. Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.	All items have been considered and addressed in the EIAR. Disturbance to ecology will be managed through mitigation measures included in: • **Chapter 5: Terrestrial Ecology,** • **Chapter 6: Aquatic Ecology** • **Chapter 7: Ornithology**	**Chapter 4: Population and Human Health** **Chapter 5: Terrestrial Ecology,** **Chapter 6: Aquatic Ecology** **Chapter 7: Ornithology** **Chapter 13: Material Assets** **Chapter 14: Cultural Heritage**
	• Negative impacts to Soils and Geology, Air and Climate, Water should be avoided	All items have been considered and addressed in the EIAR. No implications for the EIA/Design. Potential effects have been assessed in: • **Chapter 8: Soils and Geology** • **Chapter 10: Air and Climate** • **Chapter 9: Hydrology and Hydrogeology**	**Chapter 8: Soils and Geology** **Chapter 10: Air and Climate** **Chapter 9: Hydrology and Hydrogeology**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Potential negative impacts on Soils and Geology have been assessed in **Chapter 8: Soils and Geology**. Potential negative impacts have been assessed in **Chapter 9: Hydrology and Hydrogeology**. All items have been considered and addressed in the EIAR. No implications for the EIA/Design. Buffer zones have been implemented into the design of the Development to prevent negative impacts. Air Quality has been fully assessed and potential negative impacts have been identified in **Chapter 10: Air and Climate**. All items have been considered and addressed in the EIAR	
	• A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction for example should consider the sensitivity of the development and ensure mitigation is in place.	All items have been considered and addressed in the EIAR. Potential effects from noise and vibrations created as a result of this Development have been assessed in **Chapter 11: Noise**.	**Chapter 11: Noise**
	• The construction programme of developments should work to avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.	All items have been considered and addressed in the EIAR. Potential effects on Tourism have been identified and mitigation measures have been proposed in **Chapter 4: Population and Human Health**. No tourism events are anticipated within the vicinity of the Development during the construction, operational or decommissioning phases of the Project. Peak tourism periods will be avoided.	**Chapter 4: Population and Human Health**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		Potential effects on tourism as a result of the Development have been assessed in **Chapter 4: Population and Human Health**.	
	• Cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact.	All items have been considered and addressed in the EIAR. A small section of the grid route (640 m) is located along the Beara to Breifne Way. Works along this section will take up to seven days to complete. Pedestrian access will be maintained during the construction and decommissioning phases and works will be completed outside peak tourist season where possible. Potential effects on cultural heritage as a result of the Development have been assessed in **Chapter 14: Cultural Heritage.**	**Chapter 14: Cultural Heritage**
	• Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered.	All items have been considered and addressed in the EIAR. An assessment of potential effects as a result of waste generated during the construction, operational and decommissioning phases of the Project has been included in **Chapter 13: Material Assets**. In addition to this, a Waste Management Plan has been prepared as an appendix to the Construction Environmental Management Plan.	**Chapter 13: Material Assets** **Appendix 2.1 CEMP; Management Plan 5: Waste Management Plan**
	• Tourism could be considered a material asset as its impact upon the economy and the infrastructure in place to support it is a material consideration in assessing economic impact.	All items have been considered and addressed in the EIAR. There are many walking and cycling routes in the vicinity of the Development and within Counties Cork and Kerry. These routes provide activities for both international visitors and local	**Chapter 13: Material Assets**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		tourists bringing with them, minor economic gains to the locality. All items have been considered and addressed in **Chapter 4: Population and Human Health** and **Chapter 13: Material Assets**.	
	• The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.	All items have been considered and addressed in the EIAR. There are many scenic, walking and cycling routes within the vicinity of the Development and within Counties Cork and Kerry. These routes provide activities for both international visitors and local tourists. The impact of the Development on the landscape as well as the cumulative effects of other developments in the area have been assessed in **Chapter 12: Landscape and Visual**.	**Chapter 12: Landscape and Visual**
	Major Accident and Natural Disaster There is a requirement for developments to describe expected significant effects on the environment of the proposed development's vulnerability to major accidents and/or natural disasters relevant to it. Where appropriate measures should be identified to prevent or mitigate the significant adverse effects of such accidents or disasters, including resulting from climate change, on the environment and detail the preparedness for the proposed response.	All items have been considered and addressed in the EIAR. A separate chapter has been prepared to assess the impacts of major accidents and natural disasters.	**Chapter 16: Major Accidents and Natural Disasters**
	Interaction of Effects Where two or more environmental impacts combine or interact they should be considered under the prescribed topics. It is best practice to provide a table of interactions within an EIAR or EIAR Screening Report.	All items have been considered and addressed in the EIAR.	**Chapter 17: Interactions of the Foregoing**
	Mitigation	All items have been considered and addressed in the EIAR. Mitigation measures have been	**Appendix 17.1 Schedule of Mitigation Measures**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	Mitigation should follow the hierarchy of minimisation in descending order of preference- Avoid, Reduce, Remedy. Mitigation measures must be measurable and achievable within the bounds of the project.	included in each technical chapter of the EIAR for the construction, operational and decommissioning phases. A schedule of mitigation measures has also been appended to **Chapter 17: Interactions of the Foregoing.**	
	Cumulative Impact The cumulative impact is that of the project combined with any known likely project which will interact or compound an environmental impact.	All items have been considered and addressed in the EIAR. All technical chapters of this EIAR include an assessment of cumulative effects.	Chapters 4-16
	Transboundary Impact Transboundary impacts should be included in EIAR. In the case of tourism, especially international travel, the transboundary impacts may not be proximate to the EIAR site	n/a	n/a
Health Service Executive	A response was received on 10/12/2020 and contains the following points:	All items considered during the design process.	Addressed in chapters 2-16
	• The Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each: a) Description of the receiving environment; b) The nature and scale of the impact; c) An assessment of the significance of the impact; d) Proposed mitigation measures; e) Residual impacts.	All items have been included in the technical chapters of the EIAR. A description of the baseline conditions of the receiving environment has been included in each technical assessment of the EIAR. The potential effects of the Development on the receiving environment have been identified in each technical chapter of the EIAR. This includes the significance of the potential effects. Mitigation measures have been proposed against the potential effects identified and the	Chapters 4-16

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		residual impacts have been identified and their significance has been included in each technical chapter of the EIAR.	
	• Population and Human Health should be adequately assessed.	All items have been considered and addressed in the EIAR.	**Chapter 4: Population and Human Health**
	• In addition to any likely significant negative impacts from the proposed development, any positive likely significant impacts should also be assessed. The HSE will consider the final EIAR accompanying the SID/ planning application and will make comments to An Bord Pleanála and Cork County Council on the methodology used for assessing the likely significant impacts and the evaluation criteria used in assessing the significance of the impact.	All potential effects of the Development on the receiving environment have been identified in each technical chapter of the EIAR. The methodology for assessing the potential effects has been included in each of the relevant chapters. All items have been considered and addressed in the EIAR.	
	Public Consultation • It is strongly recommended that early and meaningful public consultation with the local community should be carried out to ensure all potentially significant impacts have been adequately addressed. All parties affected by the proposed development, including those who may benefit financially from the project, must be fully informed of what the proposal entails, especially with regard to potential impacts on surrounding areas. • Sensitive receptors and other stakeholders should be identified to ensure all necessary and appropriate mitigation measures are put in place to avoid any complaints about the proposed wind farm development in the future. • It is acknowledged that current restrictions around public gatherings as a result of Covid 19 prevention measures will impact on opportunities for public consultation events. However, it is expected that	The project at an early stage appointed a local Community Liaison Officer (CLO) in July 2020. Sensitive receptors and stakeholders were identified. Initially the CLO's direct engagement focused on calling to houses within 2km of the Development. Three (3 No.) Newsletters were sent to houses within 2 km of the Development between July 2020 and September 2021. A Project update letter was circulated to the same residences in November 2021. An introduction letter to FuturEnergy Ireland was circulated to the residences in December 2021. A further project update letter was circulated in March/April 2022 ad in November 2022.	Section 1.7.1 Public Consultation **Appendix 1.3: Community Consultation Report**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	meaningful public consultation, where the local community is fully informed of the proposed development, will be undertaken. Members of the public should be given sufficient opportunities to express their views on the proposal wind farm. • The Environmental Impact Assessment Report (EIAR) should clearly demonstrate the link between public consultations and how those consultations have influenced the decision-making process in the EIA. • To assist with the consultation and planning process it is recommended that the applicant develops a dedicated website for the proposed wind energy project. All correspondence, maps, project updates and documentation including the EIAR should be uploaded to this site.	Five (5 No.) national schools in the vicinity of the Development were included in an Educational Programme around Climate Change. A media release in March 2023 launched the project brochure and virtual tour exhibition. The brochure was circulated to residences within 5 km of the Development and to elected representatives. Advertisements in local newspapers displayed details of the public information days. Two public information days were held in a location that was easily accessible to local residents. All documentation availableat the public information days was in English and Irish and Irish speaking representatives were on hand to discuss the Development with local Irish speaking residents. A Pre-Application Community Consultation (PACC) Report has been submitted to Cork County Council and Kerry County Council as a standalone document as part of this planning application. The PACC Report summarises the engagement and consultation that has taken place with the local community over the project lifecycle to date. Starting from the introduction of the project through to the project's submission into planning, the PACC report includes reports of the public information day, how the Developer intends to continually engage with the local	

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Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		community into the future and how comments received have been addressed and incorporated by the Project. A dedicated project website was launched (https://inchamorewindfarm.ie/) and provides updates to the public regarding the progress of the Project.	
	Decommissioning Phase • The EIAR should detail what the eventual fate of the turbines and associated material will be, i.e., will the material be recycled or how will it be disposed of. Information should also be provided regarding the proposed methodology to be used for the disposal of the materials forming the foundations of the wind turbines. The EIAR should indicate the proposed future use of the wind farm site at the end of the planning permission period.	The decommissioning phase of the Project has been assessed in each of the technical chapters. The decommissioning of the wind farm is as follows: • Removal of five wind turbines and concrete plinths. • Removal of permanent meteorological mast. • Removal of all associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation. Ducting is to remain in-situ. • All other elements of the Development will remain in-situ. The Site Access Roads and associated drainage systems will serve ongoing forestry and agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful. • Cranes of similar size to those used for construction will disassemble each turbine	**Appendix 2.1, Management Plan 6: Decommissioning Plan**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		using the same crane hardstands. The towers, blades and all above ground components will be removed from site and reused, recycled, or disposed of in a suitably licensed facility. (The financial costs of decommissioning, at current material values, will be more than met by the recycling value of the turbine components.) • Turbines will be cut on site so as to fit on articulated trucks, therefore allowing the use of the civil construction delivery route for removal. A Decommissioning Plan has been prepared as part of the CEMP.	
	Siting, Location and details of Turbines • The EIAR should include a map and a description of the proposed location of each of the proposed wind turbines. • The Environmental Health Service expects that details (height and model) of the turbines to be installed will be available at the time planning permission is sought and will be included in the EIAR. • Details of turbine foundation structures, including depth, quantity and material to be used should be included in the EIAR.	All items have been considered and addressed in the EIAR. No implications for the EIA/Design.	n/a
	Opportunity for Health Gain • The proposed development should be assessed with a view to the potential to include opportunities for health gain within the site of the proposed wind farm by including greenways, cycle-paths or walking trails within the development site.	Areas of Coillte lands within the Development will continue to subject to the Open Forestry Policy implemented by Coillte with the Development not impacting on the use of forestry for reasons of health gain.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	Assessment of Consideration of Alternatives • The EIAR should consider an assessment of alternatives. The EHS recommends that alternative renewable energy options to on shore wind farms should be assessed as part of the EIAR.	All items have been considered and addressed in the EIAR. The EIAR considers alternatives to on-shore wind energy developments in **Chapter 3: Alternatives Considered**	**Chapter 3: Alternatives considered**
	Noise & Vibration • The potential impacts for noise and vibration from the proposed development on all noise sensitive locations must be clearly identified in the EIAR. The EIAR must also consider the appropriateness and effectiveness of all proposed mitigation measures to minimise noise and vibration. • A baseline noise monitoring survey should be undertaken to establish the existing background noise levels. Noise from any existing turbines in the area should not be included as part of the back ground levels. • In addition, an assessment of the predicted noise impacts during the construction phase and the operational phase of the proposed wind farm development must be undertaken which details the change in the noise environment resulting from the proposed wind farm development. • The Draft Revised Wind Energy Development Guidelines were published in December 2019. Whilst these have yet to be adopted, any proposed wind farm development should have consideration of the draft Guidelines.	All items have been considered and addressed in the EIAR. A baseline noise monitoring survey was undertaken to establish baseline conditions. Potential effects of Noise and Vibration on sensitive receptors have been fully assessed and mitigation measures have been proposed where necessary. This has been completed for the construction, operational and decommissioning phases of the Project and can be found in **Chapter 11: Noise.** The Draft Revised Wind Energy Development Guidelines, 2019 have been considered in the assessment.	**Chapter 11: Noise**
	Shadow Flicker • It is recommended that a shadow flicker assessment is undertaken to identify any dwellings and sensitive receptors which may be impacted by shadow flicker. The assessment must include all proposed mitigation measures. Dwellings should include all	All items have been considered and addressed in the EIAR. A shadow flicker assessment was completed as part of **Chapter 4: Population and Human**	**Appendix 4.1: Shadow Flicker Analysis**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	occupied properties and any existing or proposed properties for which planning consent has been granted for construction or refurbishment. • It is recommended that turbine selection will be based on the most advanced available technology that permits shut down during times when residents are exposed to shadow flicker. As a result, no dwelling should be exposed to shadow flicker.	**Health.** A schedule of mitigation measures has also been included in this chapter. The Development which currently complies with the WEDG (2006) shadow flicker guidelines will comply with the 2019 Draft WEDG if/when they come into effect by automatically shutting down when the control system detects that the sunlight is strong enough to cast a shadow, and the shadow falls on a property or properties.	
	Air Quality • A Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. Measures should include: - Sweeping of hard road surfaces - Provision of a water bowser on site, regular spraying of haul roads - Wheel washing facilities at site exit - Restrict speed on site - Provide covers to all delivery trucks to minimise dust generation - Inspect and clean public roads in the vicinity if necessary - Material stockpiling provided with adequate protection from the wind - Dust monitoring at the site boundary - Truck inspection and maintenance plan - Details of a road maintenance agreement between the wind farm operator and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project.	The potential effects of the Development on Air Quality have been assessed as part of **Chapter 10: Air and Climate.** Mitigation measures against these potential effects have been included in this chapter. All construction phase mitigation measures have been included in the Construction Environmental Management Plan which has been prepared as Appendix 2.1 of **Chapter 2: Project Description**. In addition to this, a full Schedule of Mitigation Measures has been included as Appendix 17.1 of **Chapter 17: Interactions of the Foregoing**. All items have been considered and addressed in the EIAR. Mitigation measures have included all items.	**Chapter 10: Air Quality**
	Surface and Ground Water Quality	The **Surface Water Management Plan (Appendix 2.1)** details the site drainage that has	**Chapter 8: Soils and Geology**

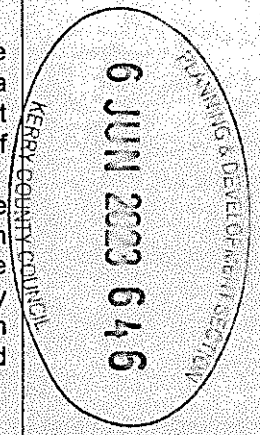
Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	• All drinking water sources, both surface and ground water, must be identified. Public and Group Water Scheme sources and supplies should be identified. Measures to ensure that all sources and supplies are protected should be described. The Environmental Health Service recommends that a walk over survey of the site is undertaken in addition to a desktop analysis of Geological Survey of Ireland data in order to identify the location of private wells used for drinking water purposes. Any potential significant impacts to drinking water sources should be assessed. Details of bedrock, overburden, vulnerability, groundwater flows, aquifers and catchment areas should be considered when assessing potential impacts and any proposed mitigation measures.	been designed for the site using the principles of Sustainable Drainage Systems (SuDS). The drainage system for the Development is designed in a manner to ensure there are no changes to the baseline water quality within or downstream of the Site. A comprehensive suite of drainage measures have been developed to protect all receiving waters from potential impacts during the construction, operation and decommissioning of the Development in the catchment of the Site and along the proposed Grid Connection Route. The assessment and associated proposed mitigation measures are in **Chapter 6: Aquatic Ecology** and **Chapter 9: Hydrology and Hydrogeology**. Consultation with GSI (2022) well database indicates there are no mapped wells within the Redline Boundary. Governing industry guidelines stipulate a buffer zone of 250 m is required of from boreholes used for drinking water abstraction when assessing excavations for Turbine Foundations. The closest mapped wells are more than 800 m from the Redline Boundary (southeast of proposed T5 works), suggesting that any potential impact from the Development is low risk for wells in the immediate vicinity. With reference to the Baseline Description in this report, the groundwater aquifer underlying the Inchamore Windfarm Site is classified as a Locally Important Aquifer (Ll) – Bedrock which is Moderately Productive only in Local Zones.	**Chapter 9: Hydrology and Hydrogeology**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
		The Grid Connection Route traverses land underlain by a LI aquifer. Similarly, a small portion of the Turbine Delivery Route, c. 5 km, is underlain by a PI, the remaining track has been routed over a LI aquifer. Any identified boreholes along these routes will highlight the significant potential for the proposed developments to impact groundwater supplies in local zones.	
	Geological impacts • A detailed assessment of the current ground stability of the site for the proposed wind farm extension and all proposed mitigation measures should be detailed in the EIAR. The assessment should include the impact construction work may have on the future stability of ground conditions, taking into consideration extreme weather events, site drainage and the potential for soil erosion. • Reference is made to a peat slide which occurred near Ballybofey in Co. Donegal on November 13th 2020 which may have been linked to construction activity at Meenbog Wind Farm. Potential impacts on water supply associated with contamination following a peat slide include sedimentation and alteration of pH levels. • The Environmental Health Service recommends that a detailed Peat Stability Assessment should be undertaken to assess the suitability of the soil for the proposed development. The EIAR should include provision for a peat stability monitoring programme to identify early signs of potential bog slides ('pre-failure indicators' see the Scottish Government's 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Developments 2017).	Ground conditions and peat depths have been assessed as part of the EIAR. A peat slide risk assessment has been prepared as part of the EIAR. All of the items have been assessed in the EIAR.	**Chapter 8: Soils and Geology**

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	Ancillary Facilities • The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen.	All items have been included in the planning drawings accompanying this application.	n/a
	Cumulative Impacts • All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR. The impact on sensitive receptors of the proposed development combined with any other wind farm developments in the vicinity should be considered. The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.	Cumulative effects have been assessed in all technical chapters of this EIAR.	Chapters 4-16.
Irish Water	Scoping response received 02/12/2020 and stated IW currently does not have the capacity to advise on scoping of individual projects. However, in general we would like the following aspects of Water Services to be considered in the scope of an EIAR where relevant; Impacts of the development on the capacity of water services (do existing water services have the capacity to cater for the new development if required). This is confirmed by IW in the form of a Confirmation of Feasibility (COF). If a development will require a connection to either a public water supply or sewage collection system the developer is advised to submit a Pre Connection Enquiry (PCE) enquiry to IW to	All items considered during the design process. No implications for the EIA/Design a) No connection to the public water supply is required. b) No upgrade to public water services is required. c) Trade effluent will not be discharged from the Development. d) There will be no discharge to sewers within the Development. e) Drinking Water Sources have been identified and assessed within Chapter	**Hydrology** addressed in Chapter 9 **Soils and Geology** addressed in Chapter 8

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available fromhttps://www.water.ie/connections/get-connected/ b) Any up-grading of water services infrastructure that would be required to accommodate the development. c) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an IW collection network d) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks & potential measures to minimise/stop surface waters from combined sewers e) Any physical impact on IW assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets f) If you are considering a development proposal, it is best practice to contact us in advance of designing your proposal to determine the location of public water services assets. Details, where known, can be obtained by emailing an Ordinance Survey map identifying the proposed location of your intended development to datarequests@water.ie. Other indicators or methodologies for identifying infrastructure located within your lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.	9. There were no implications on the design of the Project. f) No public water infrastructure traverses the Site. Irish Water will be consulted with prior to the commencement of works. g) Items have been addressed in Chapter 9. A Surface Water Management Plan has been prepared as part of the EIAR. h) Items have been addressed in Chapter 9. i) No connection to the public water supply/wastewater treatment is required. j) All items have been considered and assessed in the EIAR.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	g) Any potential impacts on the assimilative capacity of receiving waters in relation to IW discharge outfalls including changes in dispersion /circulation characterises h) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence/ present a risk to the quality of the water abstracted by IW for public supply. i)Where a development proposes to connect to an IW network and that network either abstracts water or discharges waste water to a "protected"/sensitive area, consideration as to whether the integrity of the site/conservation objectives of the site would be compromised. j) Mitigation measures in relation to any of the above *This is not an exhaustive list.* Please note ▪ The Confirmation of Feasibility from IW, to the applicant, should be issued prior to applying for planning permission. ▪ Irish Water will not accept new surface water discharges to combined sewer networks		
Minister for Environment, Climate and Communications	See scoping response received on 20th November 2020 from Geological Survey of Ireland a division of the Department of Environment, Climate and Communications. **Geoheritage** Geological Survey Ireland is in partnership with the National Parks and Wildlife Service (NPWS, Department	All items considered during the design process. Consultation with available maps (GSI) indicates that there are no recorded 'Geoheritage' sites located within the redline boundary of the Site or within the near vicinity.	**Hydrology** addressed in Chapter 9 **Soils and Geology** addressed in Chapter 8

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	of Culture, Heritage and Gaeltacht), to identify and select important geological and geomorphological sites throughout the country for designation as geological NHAs (Natural Heritage Areas). This is addressed by the Geoheritage Programme of Geological Survey Ireland, under 16 different geological themes, in which the minimum number of scientifically significant sites that best represent the theme are rigorously selected by a panel of theme experts. County Geological Sites (CGS), as adopted under the National Heritage Plan are now included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. The audit for Co. Cork has not yet been completed, however unaudited CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer. **Our records show that there are no unaudited CGSs in the vicinity of the proposed wind farm development.** **Groundwater** We recommend using our National Aquifer, Vulnerability and Recharge maps. The Groundwater Vulnerability map indicates the proposed wind farm area is of variable vulnerability. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' which can be used to inform appropriate mitigation measures. Although primarily focused on karst areas, this may provide information to benefit the proposed wind farm development. We recommend using out GWFlood tools found under our programme activities (in conjunction with OPW data), to this end.	All items considered during the design process. No implications for the EIA/Design Consultation with the GSI Groundwater Map Viewer (2022) indicates that the Wind Farm Site is underlain by areas classified predominantly mapped as 'Extreme (E)' vulnerability rating which tend to be at lower elevations, with some areas mapped as 'Rock at or Near Surface (X)' vulnerability rating particularly at higher elevations. Both the Turbine Delivery Route and Grid Connection Route traverse land with groundwater vulnerability ratings ranging from 'Moderately Vulnerable' to 'Extreme Vulnerability' (**Figure 9.9a – Groundwater Vulnerability**). Consultation with the Geological Survey Ireland online data sets as well as site visits were carried out. Peat and slope stability investigations at the Site (**Appendix 8.1**) indicate that the Site has a generally low risk probability with respect to peat slippage and slope failure under the footprint of the Development. Considering the assessment conclusions are related to the Development and construction activities including vehicular movements will be limited to the Development, areas of potentially high risk (Geohazards, for example, GSI high risk landslide susceptibility) in terms of peat and slope stability will be avoided. GSI data and map viewers have been consulted in the preparation of this EIAR.	

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
	Geological Mapping We encourage the use of the Geological Survey Ireland datasets in assessments. **Geohazards** Landslide susceptibility in the area of the proposed wind farm is variable and is classed from Moderately Low/ Moderately High to High. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so. **Natural Resources (Minerals/Aggregates)** In keeping with a sustainable approach, we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the proposed development are sustainably sourced from properly recognised and licensed facilities. **Other Comments** Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. Should any significant bedrock cuttings be created, we would ask that they will be designed to remain visible as rock exposure rather than covered with soil and vegetated, in accordance with safety guidelines and engineering constraints.	Imported stone will be from licensed facilities, as discussed in **Chapter 15: Traffic and Transportation**.	
Transport Infrastructure Ireland	Scoping response received 07/12/2020 and stated Transport Infrastructure Ireland (TII) is not in a position to engage directly with planning applicants with respect to proposed Developments. TII will endeavour to consider and response to planning applications referred to it, given its status and duties as a statutory consultee under the Planning Acts.	No implications for the EIA/Design	n/a

Consultee Organisation	Response Received	Implications for the EIA/Design	EIAR Chapter/Section where comments have been addressed
OPW	No response received	n/a	n/a
The Heritage Council	No response received	n/a	n/a
The Arts Council	No response received	n/a	n/a
Údarás na Gaeltachta	Acknowledgement of Scoping Receipt (16/11/2020) No response received	n/a	n/a

1.11 AVAILABILITY OF INFORMATION

The EIAR may be viewed online on the following website (www.inchamorewindfarm.ie).

The planning application may be inspected or purchased at a fee not exceeding the reasonable cost of making a copy, at the offices of the planning authority during its public opening hours at the following address.

The Offices of Cork County Council, Ground Floor, County Hall, Carrigrohane Road, Cork, T12 R2NC.

1.12 GLOSSARY OF COMMON ACRONYMS

The common acronyms used throughout this EIAR are contained in Volume IV: **Appendix 1.2**.

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This Chapter of the EIAR provides a description of all elements of the Project and forms the basis of the assessments presented within Chapters 4 to 17. This Chapter provides details of the construction, operational and decommissioning phases.

This Chapter includes an overview of the Project followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Project to reduce effects, also known as 'Embedded Mitigation' measures, are set out throughout the EIAR. In addition to these Embedded Mitigation measures, mitigation and enhancement measures where specifically relevant to their assessment topic are also set out.

This Chapter of the EIAR is supported by Figures in **Volume III** and the following Appendix documents provided in **Volume IV**:

- Construction Environmental Management Plan (CEMP) in **Appendix 2.1**
- Wind Farms within 20 km of the Development in **Appendix 2.2**
- Grid Connection Details in **Appendix 2.3**
- List of Projects for Cumulative Assessment in **Appendix 2.4**
- Consideration of Afforestation in **Appendix 2.5**

Common acronyms used throughout this EIAR can be found in **Appendix 1.2**.

2.2 PROJECT DESCRIPTION

Permission is being sought by the Developer for the construction of 5 No. Wind Turbines, a meteorological mast, an on-site substation, Turbine Delivery Route and all ancillary works.

The development will consist of

- A wind farm with an operational lifespan of 35 years (from the date of commissioning of the development).
- The construction of five turbines with an overall ground to blade tip height ranging from 177 m to 185 m inclusive; a rotor diameter ranging from 149 m to 155 m inclusive; and a hub height ranging from 102.5 m to 110.5 m inclusive.
- Construction of permanent turbine hardstands and turbine foundations.
- Construction of one temporary construction compound with associated temporary site offices, parking areas and security fencing.

- Installation of a (35-year life cycle) meteorological mast with a height of 110 m and a 4 m lightning pole on top, such that the overall structure height will be 114 m.
- Development of one on-site borrow pit.
- Construction of new permanent internal site access roads and upgrade of existing internal site access roads to include passing bays and all associated drainage infrastructure.
- Development of a permanent internal site drainage network and sediment control systems.
- Construction of a permanent 38 kV electrical substation including a control building with welfare facilities, all associated electrical plant and equipment, parking, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works.
- All associated underground electrical and communications cabling connecting the wind turbines to the on-site wind farm substation.
- Ancillary forestry felling to facilitate construction of the Development.
- All associated site development works including berms, landscaping, and soil excavation.
- Upgrade of existing forest access roads to include passing bays and all associated drainage infrastructure.
- Upgrade works on the Turbine Delivery Route to include the following:
    - Works at an entrance to an existing forest road accessed off the N22 to include localised widening of the forest road and creation of a splayed entrance, removal of existing vegetation for visibility splays and removal of street furniture to facilitate construction traffic including the delivery of abnormal loads and turbine component deliveries.

A 10-year planning permission and 35-year operational life for the wind turbines and met mast, from the date of commissioning of the entire wind farm is being sought. This reflects the lifespan of modern-day turbines.

A permanent planning permission is being sought for the substation and all associated electrical plant, equipment cabling security fencing and gates, wastewater holding tank, and all ancillary structures and works as these will become an asset of the national grid under the management of ESB & EirGrid and will remain in place upon decommissioning of the wind farm.

The Grid Connection consists of one 38 kV substation (to include one control building with welfare facilities, all associated electrical plant and equipment, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works) and a 38 kV cable to connect to Ballyvouskill 220 kV Substation.

A temporary access road off the N22 in the townland of Cummeenavrick will facilitate the safe turning of vehicles leaving the Site.

Permission is not being sought for a Grid Connection Route or the turning area in Cummeenavrick, however the below is assessed as part of the Project in the EIAR:

- All works associated with the permanent connection of the wind farm to the national electricity grid comprising a 38 kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation, in the townland of Inchamore and onto the townlands of Inchamore, Derreenaling, Derryreag, Cummeenavrick, Glashacormick, Clydaghroe and Cummeennabuddoge to the existing Ballyvouskill 220 kV Substation in the townland of Caherdowney.
- The construction of a temporary access road off the N22 in the townland of Cummeenavrick to facilitate a 180 degrees turning manoeuvre by construction vehicles and reinstatement at the end of the construction period.

2.3 SITE LOCATION AND ENVIRONS

2.3.1 Introduction / Existing Land Use

The Site, as shown in **Figure 2.1**, is located within an agricultural and forested landscape. Inchamore is situated between Milleeny, Co. Cork, Coomagearlahy, and Derryreag, in Co. Kerry. The Site is located 5.9 km west of Ballyvourney, Co. Cork and borders the county boundary between Cork and Kerry. It is 54 km west of Cork City, and 23 km north-east of Kenmare, Co. Kerry.

The Development is located within the townlands of Inchamore, Mileeny Derryreag and Derreenaling.

The overall length of the grid connection between the substation and the existing 220 kV GIS substation (**Figure 1.2**) is 19.9 km, of which 1.3 km is within the Site. The remaining 18.6 km is located off-road and in third-party lands through the townlands of Inchamore, Derryreag, Derreenaling, Cummeenavrick, Glashacormick, Clydaghroe, Cummeennabuddoge and Caherdowney. The proposed grid connection will consist of underground 38 kV cables.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are included as part of this application and are located on the access road from the N22 to the Site.

The Site extends to 170.1 ha of which 145.4 ha largely consists of low yielding, commercial forestry. Coillte own 76.0 ha of the forestry (53% of forestry on site) while 69.4 ha (47%) of the forestry is owned privately.
Coillte owned land comprises different stages of coniferous plantation forestry. The species comprise mainly of Sitka Spruce with small pockets containing Lodgepole Pine, Alder, Birch and Beech.

The remaining land (24.6 ha) is third party property and the principal land use in the general area consists of a mix of agricultural sheep and cattle grazing, farmland, residential properties, agricultural structures and open mountain heath.

There are 39 houses within 2 km of the proposed turbines.

In addition to this, there is an abandoned house located to the west of the proposed substation, on Coillte lands and within the Site. This house is under the ownership of Coillte and will not be occupied for the lifetime of the Development.

Of the 39 No. houses within 2 km of the proposed turbines, the closest house to a turbine that is to be assessed as part of this EIAR, is H1. This is located 753 m from T2. All houses located within 2 km of the proposed turbines are shown on **Figure 1.3**.

2.3.2 Removal of Forestry and Replant Lands

The Site contains 142.4 ha of commercial forestry. Turbines T2, T3, T4 and T5 are surrounded by forestry. Tree felling will be required as part of the Project. To facilitate the construction of access roads, civil works, site compounds, borrow pits and Turbine Hardstands, 26.43 ha coniferous forestry will need to be permanently clearfelled. The felling area proposed is the minimum necessary to construct the Development and to comply with any environmental mitigation.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in:

- Forest Service's (Department of the Marine and Natural Resources) Forestry and Water Quality Guidelines (2000)

- Buffer Zone Guidelines
- Ground Preparation and Drainage
- Roads
- Harvesting

- Forest Service's (Department of the Marine and Natural Resources) Forest Harvesting and the Environmental Guidelines (2000)
  - Harvesting
  - Roading

The use of existing forestry infrastructure will be maximised to lessen disturbance from machines used for felling.

In this regard, before any felling works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans (Please see **Appendix 2.1** and **Appendix 2.2**);
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

All construction of tracks, including the creation of buffer zones and roadside drainage, will take into consideration the following specifications, which have been developed by the Forest Service (Department of Agriculture, Food and the Marine (DAFM)):

- Forest Protection Guidelines (Forest Service - Department of Marine and Natural Resources)
  - Protecting against future threats – pests and diseases
- Forestry and Water Quality Guidelines (Forest Service - Department of Communications, Marine and Natural Resources)
  - Buffer Zone Guidelines
  - Ground Preparation and Drainage
  - Roads
    - Harvesting
- Forest Harvesting and Environmental Guidelines (Forest Service - Department of Marine and Natural Resources)
  - Harvesting
  - Roading

- Forestry and Freshwater Pearl Mussel Requirements - Site Assessment and Mitigation Measures
- Forest Biodiversity Guidelines
- Forestry and The Landscape Guidelines
- Forestry and Archaeology Guidelines

This forestry to be felled is mostly consisting of Sitka Spruce or Lodgepole Pine and the felling is expected to take up to 3 months.

The above felling hectarage includes some areas which have recently been felled already for commercial timber extraction. Detailed consideration of the approach to afforestation requirements associated with the Project is included in **Appendix 2.5: Consideration of Afforestation**. It should be noted that the permanent clearfelling of trees in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clearfelled is also subject to licensing ('afforestation licensing'). The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing. In light of the foregoing and for the purposes of this Project, the Developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10 km from the (wind farm) Site and also outside any potential hydrological pathways of connectivity i.e., outside the catchment within which the proposed project is located. On this basis it is reasonable to conclude that there will be no more than imperceptible, indirect or in-combination effects associated with the replanting. In addition, the Developer commits to not commencing the Project until both felling and afforestation licences are in place and this ensures the afforested lands are identified, assessed and licensed appropriately by the consenting authority.

2.3.3 Wind Farms in the Area

There are 27 wind farms within 20 km of the Site. **Figure 2.3** shows the location of proposed, permitted and operational wind farms within a 20 km radius of the proposed turbines. **Appendix 2.2** provides further information on these wind farms.

- The nearest operational wind farm is Coomagearlaghy Kilgarvin Wind Farm which is located 2.7 km to the south-west of the Site.
- The nearest permitted but not yet constructed wind farm is Gortnakilla, Clonkeen Killarney, 1.87 km to the west.
- Gortyrahilly Wind Farm is a proposed 14 No. turbine wind farm located 4.95 km south of Inchamore Wind Farm. Gortyrahilly Wind Farm has the same developers as Inchamore Wind farm.

- Wind farms which are in the pre-application stages have also been included. Cummeennabuddoge Wind Farm has been included and is being designed and developed by the same developers as the proposed Inchamore Wind Farm.

Please see further details in **Appendix 2.2**.

2.3.4 Land Ownership

A portion of the Site (76.0 ha) is owned by Coillte. However, the majority of the Site is located on lands under the ownership of third-party private landowners who have consented to the application and the Development. Letters of consent accompany this application.

2.4 WIND RESOURCE

Due to the location, in the south-west of Ireland, and elevation, the Site experiences high average annual wind speeds. The Irish Wind Atlas produced by Sustainable Energy Ireland shows average wind speeds for the country and it shows that wind speeds on the Site are consistent with those that can facilitate a wind farm development (8.2 m/s at 75 m, 8.3 m/s at 100 m and 9.05 m/s at 150 m).

2.5 SITE INFRASTRUCTURE AND CONSTRUCTION

2.5.1 Proposed Layout Design

The layout of the Development has been designed to minimise the potential environmental effects of the wind farm while utilising the maximum energy yield from the Site's wind resource. The layout design was informed by the following constraints and buffers:

- No works will occur within a distance of at least 65 m from watercourses (excluding Road and Grid crossings).
- No works will occur within a distance to land drains (i.e., perforated drain pipes, used in domestic, commercial, agricultural and industrial areas to stop the ground from being waterlogged) of at least 25 m (excluding Road and Grid crossings).
- No works will occur within a distance to archaeological monuments and structures of at least 100 m.
- No works will occur within a distance from turbines to inhabited houses of at least 740 m.
- Avoidance of ground slopes of greater than 10 - 14 %.
- Avoidance of existing telecommunications infrastructure and links that traverse the site.
- Avoidance of sensitive watercourses containing Freshwater Pearl Mussel (*Margaritifera margaritifera*).

The overall layout of the Site is shown in **Figure 2.2**. This figure shows the proposed locations of the wind turbines and associated hardstanding areas, electrical substation, met mast, temporary construction compound, borrow pit, internal access roads and the site entrance. The ITM coordinates of the five turbines are listed in **Table 2.1**.

Table 2.1: Turbine ITM Coordinates

Turbine No.	ITM Easting (m)	ITM Northing (m)	Elevation (m)
T1	512358	578940	450.90
T2	512852	578514	371.56
T3	512972	579041	400.12
T4	513613	579050	370.92
T5	513947	578689	371.72

2.5.2 Wind Turbine

The proposed turbines will be of modern design and will be a three-bladed, rotor upwind of the tower, variable speed, pitched blade regulated machine. Turbine appearance will be a matt non-reflective finish in a white, off-white or grey colour. The foundation-to-tip height will range from 177 m to 185 m.

The turbine will have a circular based tower, sitting on a reinforced concrete foundation. The tower will support the nacelle, rotor hub, and rotor blades. Commercial wind turbine towers are made of steel or a hybrid of steel and concrete. The components within the nacelle are mainly metal (steel, copper, aluminium, etc.) with a metal/plastic/glass-reinforced plastic (GRP) body. The blades can be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or similar composite materials.

Each turbine will have a generator with a capacity of between 5.6 MW and 6.6 MW. The turbines may be direct drive machines or contain a gearbox. The final turbine will be chosen in a competitive tendering process as part of the Project financing process, after all necessary consents have been secured.

A schematic drawing of the candidate turbines is shown on **Figure 1.4**.

This EIAR assessment considers and assesses all scenarios within the range of turbine parameters. The range of turbine parameters can be seen in **Table 2.2**.

Table 2.2: Turbine Parameters

Turbine Parameter	Assessment Envelope
Turbine Blade Tip Height	177 m to 185 m
Rotor Diameter	149 m to 155 m
Hub Height	102.5 m to 110.5 m
Turbine Foundations (Diameter)	22 m to 25.5 m
Turbine Foundations (Depth)	2.8 m to 3.2 m
Turbine Foundations (Plinth Diameter)	5 m and 6 m

2.5.3 Turbine Hardstands and Turbine Foundations

The Turbine Hardstand is designed to accommodate the delivery, laydown, and assembly of turbine components (in particular, rotor assembly) prior to turbine lifting and assembly and is shown in **Figure 2.4**. The Turbine Hardstands are needed to support the cranes during turbine construction, operation and maintenance and for decommissioning. The Turbine Hardstands will be constructed first and used to facilitate Turbine Foundation construction, such as steel reinforcement delivery and pouring of concrete.

The total area of each Turbine Hardstand will be 4,740 m^2 and includes the main crane hardstand (2,770 m^2), the component set down area (1,290 m^2), the assist crane hardstands (290 m^2) and the vehicle parking (390 m^2) as shown in **Figure 2.4**. These areas will consist of hardcore material topped with crushed stone. 'Areas cleared of any obstacles' (3,060 m^2) will be left as greenfield areas for lifting operations associated with wind turbine components.

Construction of the Turbine Hardstand and met mast hardstand will require the excavation of soils, the laying of a geotextile material on the formation surface and placing engineered stone and a top dressing. The main Turbine Hardstands and associated storage and assembly areas will cover an area of 4,740 m^2 each and will be 0.6 m in depth depending on the local bedrock profile and the varying soil depth. This gives a surface area of 23,700 m^2 for the five turbines.

The Turbine Foundations will range between 22 m to 25.5 m in diameter and have a depth ranging from 2.8 m to 3.2 m. The Turbine Foundation design will depend on the turbine type and will be decided by the structural engineers at detailed design stage and will be within these design parameters. The central part of the foundation (plinth) as seen on **Drawing No. 6226-PL-701** and **6226-PL-702**, will range between 5 m and 6 m in diameter and will be raised from the main Turbine Foundation below ground level. It will encompass a cast-in insert or bolts to connect to the bottom of the turbine tower and reinforced bar structural elements.

The area around and above the Turbine Foundation will be backfilled with compacted stone or crushed rock.

Further site investigations will be undertaken post consent to confirm that conditions do not vary from those encountered during site investigations. Traditional gravity foundations are considered for EIA purposes as the results of the site investigation indicate that piled foundations are not predicted to be required. These are concrete structures that depend on their own weight to achieve sufficient stability against overturning and sliding.

Turbine Foundations will need to be taken down to a level where the underlying soil or rock can bear the weight of a structure without shifting or compressing. This will be done by excavating through the peat / soil, subsoil and rock where necessary (depending on the various geological locations).

The method of construction for a Turbine Foundation is described as follows:

- Install temporary drainage around the perimeter of the excavation;
- Excavate peat / soil and rock;
- Back fill the foundation with excavated rock;
- Form a level working area to build the foundation;
- Install formwork and reinforcement;
- Pour the concrete;
- Once the concrete has set and the earthing system is in place, backfill the foundation with suitable excavated material, and
- Use the soil to build up the area around the Turbine Foundation perimeters (0.6 m width x 0.6 m depth).
- All excess soil will be placed in the on-site borrow pit.

2.5.3.1 *Machinery Access for Felling*

For the 26.43 ha of felling, it is intended that much of the existing forest road infrastructure will be utilised. The turbine layout seeks to maximise use of the forestry access tracks and fire lines already present. Where there is already a road there will be less intrusion and disturbance to the soil and surrounding trees. Some widening and building up of the existing road network will be required as part of the infrastructure for the Development which will minimise impacts on habitats compared to the construction of new forest roads. These upgraded roads will also be used for access for felling.

2.5.4 Access to the Site

The proposed site entrance is located to the north of the Site on the N22. The Turbine Delivery and Construction Haul Route will utilise this site entrance. The site entrance is shown on **Figure 2.5**.

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed at Ringaskiddy Port, County Cork. From there they will be transported to the N22 and on to the access track on private lands and on to the Site. Works required to the forest roads within the site include widening, reducing the gradient of road sections, surfacing with bitumen macadam and implementing a drainage plan.

For abnormal loads between Ringaskiddy Port and the Site, works will be required to facilitate the delivery of turbine components. These will be relatively minor in nature, for example, temporary removal of street furniture and signage. The extent of works has been determined by reference to the Collett Report of October 2021 (**Appendix 15.1**) and to the results of a swept path analysis. The Swept Path Analysis drawings are included as **Appendix 15.2**.

The delivery of the turbines will require co-ordination with a number of statutory bodies including Cork County Council, An Garda Síochána and delivery details are set out in **Chapter 15: Traffic and Transportation**.

2.5.5 Site Access Roads (Internal Road Network)

The Site Access Roads are necessary to allow access for cranes and delivery trucks during construction of the Development and during servicing/repairs to the wind turbines. The existing forest tracks/Site Access Roads will be used as far as possible to minimise additional land take. These roads will be upgraded as necessary so that the maximum width will be 4.5 m. Site Access Roads will be wider at bends and at passing bay locations where

the width will be 5.5 m. Gradients will be limited to no more than 1 in 7 (14%) and a stone layer provided, so as to provide a good grip during wet weather. Gradients of Site Access Roads will not exceed this value.

Table 2.3: Estimated Excavation for Road Construction

Road Section	Length (m)	Width (m)	Area (m²)	Average Peat Depth (m)	Depth to firm Sub-soil/Rock (m)	Depth of Sub soil to be excavated (m)	Total Volume to be excavated (m³)	Vol of peat to be excavated (m³)	Vol of soil to be excavated (m³)	Vol of rock to be excavated (m³)
Upgraded Site Access Road	3,102	2.00	6,203	0.60	0.70	0.10	4,342	3,722	677	-
New Site Access Road	3,555	4.50	15,998	0.60	0.70	0.10	11,199	9,599	1,714	-
Off-site Road Upgrade Nodes at N22	-	-	1,118	-	0.30	0.30	335	-	335	-
Totals	**6,657**	**6.50**	**25,024**	**1.20**	**1.70**	**0.50**	**15,876**	**13,321**	**2,556**	-

As set out in **Table 2.3**, 3,102 m of the existing Site Access Road will be upgraded. This will involve widening the roads to cater for larger vehicles and loads. Site Access Roads are shown on **Figure 2.6**. Upgraded Site Access Roads will be approximately 6,203 m^2 in surface area and will require approximately 1,400 m^3 of crushed stone material.

There will also be 3,555 m of new Site Access Roads required for the Development, none of which will be floated, based on the results of the site investigations. These will be constructed to provide a width of 4.5 m and 5.5 m at bends and will cover an area of 15,998 m^2 and require 1,700 m^3 of crushed rock. These roads will be excavated to a level where the underlying soil or rock that can bear the weight of traffic without shifting or compressing. They will be constructed using rock from the on-site borrow pit and capping stone from nearby quarries listed in section 15.2 of **Chapter 15: Traffic and Transportation**. The Site Access Roads will facilitate a minimum 12 tonne axle construction loading. The design will consist of 250 mm to 510 mm of sub-base material. The Site Access Road construction detail is shown in **Figures 2.7 and 2.8.**

The Site Access Road layout avoids environmental constraints and follows the natural contours of the land. Every effort has been made to minimise the length of road necessary.

Site Access Roads will be maintained during the construction phase. This will involve cleaning and surface improvement works. Harmful constituents from fuel spills and drips such as hydrocarbons pose a risk of environmental contamination and also a risk to human health if found in drinking water sources. All imported stone to the Site will have undergone appropriate quality testing. When weathered, the stone will not contain any constituents which may be harmful to the environment, surface and groundwater in particular. Further details of the prevention of this can be found in the Emergency and Response Management Plan of the CEMP in **Appendix 2.1**.

There are three proposed crossings of land drains and natural streams/flushes along the internal Site Access Roads. All crossings are Clear Span Bridges. The bridges will be constructed with reinforced concrete and will join to the gravel Site Access Tracks. The bridges will range from 10 m to 27.5 m in length. Timber post and rail fencing will be included with galvanised chain link fence on the internal face. Further to consultation with Inland Fisheries Ireland (IFI), the proposed crossings have been designed in accordance with Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, 2016 as set out in **Management Plan 2: Water Quality Management Plan** of the CEMP (**Appendix 2.1**). Details of the crossings are included in Drawings No.'s **6226 PL WC-01 to 6225 PL WC 03**.

In addition to this, six service crossings, 113 No. existing culvert crossings and three watercourse/bridge crossings occur along the Grid Connection Route. This is detailed in **Appendix 2.4: Grid Connection details**.

2.5.6 Met Mast

As part of the grid code[1] requirements and as an independent assessment of wind farm performance, all wind farms with an installed capacity of greater than 10 MW are required to supply continuous, real-time weather data for the wind farm location. The data required is the wind speed and wind direction at turbine hub height, air temperature and air pressure. The data required for the Development will be provided by a dedicated meteorological mast measuring 110 m in height with a 4 m lightning mast (location as detailed in **Figure 2.2**).

The Met Mast will be located in the south-west of the Site as detailed in **Figure 2.2**. It will be a free-standing lattice type structure as shown in **Figure 2.9**. The Met Mast foundation will be 10 m by 10 m, with a depth of 2.25 m. It will be designed and constructed similarly to the Turbine Foundations. It will encompass a cast-in insert or bolts to connect to the

[1] EirGrid (15 December 2021). EirGrid Grid Code Version 10

bottom of the met mast and reinforced bar structural elements. The area around and above the foundation will be backfilled with compacted crushed rock. The Met Mast will be linked to 38 kV Substation via buried Internal Cabling for power and communication. It will be required for the full operational duration of the Development.

2.5.7 Electrical Substation, Control Building and Associated Compound

It is proposed to construct one 38 kV electricity substation within the Site, as shown on **Figure 2.2.** This will provide a connection point between the wind farm and the grid connection point at the existing Ballyvouskill 220 kV Substation. Electricity transmitted between the turbines and the substation on the Site will be at 38 kV. The layout of the substation and compound is further detailed in **Figure 2.10.**

The substation will serve two main functions:

1) provide housing for switchgear, control equipment, monitoring equipment, and storage space necessary for the proper functioning of the wind farm, and
2) allow for metering and for switchgear to connect to the National grid.

The construction and electrical components of the substation will be to EirGrid specifications. The substation compound area will be 1,314 m^2 and the foundation will be 0.6 m in depth and will be constructed from engineered stone material using similar construction techniques (as detailed in **Appendix 2.1**) as for the Turbine Hardstands. The overall compound will be enclosed by a 2.65 m high palisade fence and will contain a single control building, ancillary equipment, including the transformers, switch gear, fault protection, metering, car parking and other ancillary elements necessary for the operation of the Development. It will also include a container sized unit which can be used to accommodate a statcom (for grid reactive power compensation) or a harmonic filter for grid stabilisation.

The control building will contain an ESB room, control room, switchgear room, small store, an office and toilet. The control components will include metering equipment, switchgear, the central computer system and electrical control panels. A spare parts store and workshop will also be located in the control building. The control building will be a single story pitched roof structure with traditional rendered finishes. Details of the control building are shown on **Figure 2.10**. The appearance and finish of the control building will be similar to an agricultural building with a slated roof and nap plaster finish. It will have a suitably sized footpath around it and an adjacent parking area. The final finish of the control building will be an off-white or grey colour.

There will be four lightning monopole protection masts which will range between 16 m and 18 m in height and associated site works. Warning / health & safety signage will be displayed as is normal practice for such installations. Motion sensitive lighting only will be used. It is proposed to install a rainwater harvesting system as the source of water for toilet facilities. A potable water supply will be brought on site in bottles. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. All wastewater will be tankered off-site by a licensed waste collector to the nearest wastewater treatment plant, Ballyvourney/Ballymakeera. There will be no on-site treatment of wastewater.

A telecommunication antenna will be fixed externally to the substation control building for communication and control purposes (e.g., for the Supervisory Control and Data Acquisition (SCADA) System).

2.5.8 Transformers and Internal Cabling

Each turbine will be connected to the substation on site via underground Medium Voltage (MV) 38 kV cables. There will be circa 4,243 m of internal cabling. Fibre-optic cables will also connect each wind turbine to the wind turbine control system located within the Control Building. The electrical and fibre-optic cables running from the turbines to the substation compound will be run in cable ducts 1 m below the ground surface within the Site Roads and/or their verges.

2.5.9 Grid Connection

A Grid Connection offer will be sought from the grid system operator by application to EirGrid. The substation will connect via underground 38 kV cables to the existing Ballyvouskill 220 kV substation. The cable will connect into existing infrastructure within the confines of the substation and its compound.

The route of this underground Grid Connection Route is provided in **Figure 1.2.** The overall length of the Grid Connection Route between the substation and the existing 220 kV GIS substation is 19.9 km, of which 1.3 km is within the Site. The remaining 18.6 km is located off-road and in third-party lands.

The proposed grid route will follow the old route of the N22 for a short distance (c.0.469 km) before following forestry tracks to the existing Ballyvouskill Substation.

The Grid Connection will be constructed to the requirements and specifications (CDS-GFS-00-001-R1) of EirGrid. The electricity will be transmitted as a three-phase power supply meaning there will be three individual conductors in each cable circuit. The three conductors will be laid in separate ducts which will be laid in accordance with EirGrid functional specifications (CDS-GFS-00-001-R1[2]) for 38 kV underground cables. The width of a 38 kV cable trench with a trefoil formation will be 600 mm. The depth of the trench for 38 kV cables is 1.22 m. A separate duct will be provided within the trench for fibre optic communications. (Please see **Appendix 2.4**)

The following is a summary of the main activities for the installation of ducts:

- Confirmatory drawings for all existing services will be obtained from EirGrid, Gas Networks Ireland, Eir, Local Authorities and Irish Water.
- Immediately prior to construction taking place, the area where excavation is planned will be surveyed by CAT scan (sub-surface survey technique to locate any below-ground utilities) and all existing services will be verified. Temporary warning signs will be erected.
- Clear and visible temporary safety signage will be erected all around the perimeter of the live work area to visibly warn members of the public of the hazards of ongoing construction works.
- A 13-tonne rubber tracked 360-degree excavators will be used to excavate the trench to the dimensions of 600 mm wide by 1.22 m deep.
- A silt fencing filtration system will be installed on all existing drainage channels before and for the duration of the cable construction to prevent contamination of any watercourse.
- Once the trench is excavated, a 50 mm depth base layer of sand (in road trench) or concrete (off road trench) will be installed and compacted. All concrete will be offloaded directly from the concrete truck into the trench.
- uPVC ducts will be installed on top of the compacted base layer material in the trench.
- Once the ducts are installed, couplers (a device used for joining pipes) will be fitted and capped to prevent any dirt entering the unjointed open end of the duct.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to record the exact location of the ducts.
- The co-ordinates will be plotted on as-built record drawings for the grid connection cable operational phase.

[2] https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf

- When ducts have been installed in the correct position on the trench base layer, sand (in road trench) or concrete (off road trench) will be carefully installed in the trench around the ducts so as not to displace the duct and compacted.
- Timber spacer templates will be used during installation so that the correct cover of duct surround material is achieved above, below and at the sides of the duct in the trench.
- A red cable protection strip will be installed above the layer of material surrounding the duct and for the full length of the cable route.
- A layer of concrete (in road) or excavated material (off road) will be installed on top of the duct as a surround material to a level 300 mm below the finished surface level.
- Yellow marker warning tape will be installed for the full width of the trench, and for the full length of the cable route, 300 mm from the finished surface level.
- The finished surface of the road will then be reinstated and finished with a bituminous layer. For off-road sections of the Grid Connection Route, the trenches will be reinstated with the related excavated material.
- Precast concrete cable joint bays (junction boxes see Section 2.5.9.1 below) will be installed within the excavated trench.
- The junction boxes will be backfilled and the surface above the junction box will be finished with a bituminous layer. The cable junction boxes will be opened a second time during cable pulling and jointing, after which the finished surface above the joint bays will be reinstated again to its original condition.
- When trenching and ducting is complete, the installation of the grid connection cable will commence between the substation and the existing 220 kV substation at Ballyvouskill.
- The underground cable will be pulled through the installed ducts from a cable drum set up at one joint bay and using a winch system which is set up at the next joint bay, the cable will be pulled through.
- The cables will be jointed together within the precast concrete Joint Bay.
- The surface above each cable joint bay will be finished with a bituminous layer to the satisfaction of the Local Authority and as good as the pre-existing condition.

2.5.9.1 Joint Bays

Joint Bays are pre-cast concrete chambers along the Grid Connection Route where individual lengths of cables will be joined to form one continuous cable. A joint bay is constructed in a pit. Each joint bay will be 6 m long x 2.5 m x 2.3 m deep. A reinforced concreted slab will be constructed on top of the bay.

The 18 No. joint bay locations have been dictated by suitable terrain and access to facilitate the operation of cable pulling equipment at any phase of the development and future operation of the installation in accordance with the EirGrid specifications (CDS-GFS-00-001-R1).

Communication chambers, which are similar to small manholes, will be installed at the joint bay locations to facilitate connection of fibre-optic communication cables.

2.5.9.2 Directional Drilling Works

Three water crossings along the proposed Grid Connection route (**Appendix 2.4, Part 4**) will be constructed by means of directional drilling technology and the rest will be by watercourse/bridge crossings (three) or open trenching of existing culverts. Where the Grid Connection Route is within existing road infrastructure, these watercourse crossings have already been established. For off-road sections, there are no proposed water course crossings.

Directional drilling is the practice of drilling holes in a horizontal direction for the laying of ducts which contain cables beneath features such as a watercourse. The directional drilling commences at an excavated area known as the launch pit which is the entry point for pipes and ducts to be placed. The drill rods are pushed through the ground from the launch pit to the reception pit (similar to launch pit but at the other side of the watercourse). At the reception pit, the pipes are attached to the lead drill rod and pulled back through the ground to the launch pit. The crossings will comprise 4 x 110 mm High Performance Polyethylene (HPPE) pipes/ducts. Two separate excavations will be made either side of the watercourse to a depth of 2 metres to accommodate the directional drilling launch and reception pits. Spoil arisings will be stored adjacent to the pit locations for reinstatement, at a minimum 25 metre buffer distance from the watercourse. These temporary spoil mounds will have side slopes battered back to 1:1. Silt fencing will be erected around the base of each temporary mound prior to excavation. The excavation launch and reception pits will be reinstated on completion of drilling and jointing operations.

The drill head will be placed in the open excavation (launch pit) and it will be guided in by the operator for the first 1-2 metres. A series of drill rods will be connected to the head as it travels further along the shaft.

The drill position is always known to the operator and the drill can be manoeuvred in three planes / axes. A surveyor will monitor drilling works to ensure that the modelled stresses

and collapse pressures are not exceeded. A drilling lubricant will be required. This will be delivered directly to the drill head by hydraulics. The lubricant will be chemically inert bentonite slurry mixture which lubricates the drill head and removes the drilled earth and stone. Once the crossing is drilled, the drill head is exposed at the reception pit and removed. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side. The drill rods are connected to the duct pipe and the drill is reversed by pulling the pipe back through the channel.

A spoil volume of 4 m^3 will be excavated for each 100 m run of four pipes. This spoil will be largely subsoil material. This material will exit the launch pit within the bentonite slurry mixture. A mobile bunded tank will be located next to the launch pit into which the material/slurry mixture will be pumped. This will be stored outside of the 65 m watercourse buffer zone.

2.5.10 Borrow Pit

One borrow pit will be constructed as part of the Development, as per **Figure 2.2.** It will be located west of T5 and covers an area of 38,674 m^2. As outlined in **Table 2.4**, the borrow pit will provide 50,276 m^3 excavated material to provide fill for the roads, hardstands, upfill to foundations and the temporary compound. The borrow pit will be excavated only as required. Where rock and fill material are available from the excavation of Turbine Foundations (as per **Table 2.4 and Table 2.5**), this material will be used first. The use of an on-site borrow pit will reduce the need to transport material to the Site.

Once the required rock has been extracted from the borrow pit, it will be reinstated using any surplus inert material from the site and made secure using permanent stock proof fencing. The method for restoration of the borrow pit is to encourage stabilisation and early establishment of vegetation cover, where available, vegetative sods/turves or other topsoil in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface. The borrow pit will be reinstated with excavated material from the Site and will be capped to a level of 0.8 m above the existing ground level.

Table 2.4a: Volume of Rock required from Borrow Pits

Volume of imported rock required for road and hardstand surfacing (m^3)	Rock required for Road Constructio n/ Upgrade (m^3)	Rock required for Turbine Hardstand Construction (m^3)	Total Rock required for Construction (m^3)	Volume of Rock to be Extracted from Excavations (m^3)	Rock required from Borrow Pits (m^3)
4,979	13,741	39,105	52,846	3,004	49,842

Table 2.4b: Volume of Rock to be Extracted from Borrow Pits

Area (m^2)	Depth (m)	Volume to be extracted from Borrow Pits (m^3)
38,674	1.3	50,276

Table 2.4c: Volume of Excavated Material to be Re-used On-Site

Total Volume (m^3) of Excavated Material to be stored on site	Volume of Borrow Pits (m^3)	Volume used to top borrow pits (m^3)	Total Volume of material to be stored in Borrow Pits (m^3)	Volume to be used in berms (m^3)
77,478	50,276	30,939	81,215	605

Excavated material will be used in berms around Turbine Foundations and Turbine Hardstands. The remainder of the material will be used to reinstate the onsite borrow pit (**Appendix 2.1 CEMP, Management Plan 4: Peat and Spoil Management Plan**).

Site investigation borehole logs indicate that bedrock is showing minor signs of weathering at the Site. Unconfined Compressive Strength results indicate the bedrock underlying the Site is considered weak. Details of the site investigations that were carried out and the stone type/suitability are provided in **Appendix 8.1: Site Investigation Survey**. **Tables 2.4 a, 2.4 b** and **2.4 c** are based on the trial pit and borehole log data within **Appendix 8.1**. Where rock is seen as unsuitable, rock will be imported from local quarries, as identified in **Chapter 15: Traffic and Transportation**.

When the borrow pit is no longer required, it will be reinstated using any surplus inert material such as peat and subsoil from the Site, allowed to restore naturally and made secure using permanent stock proof fencing.

The rock will be extracted from the proposed borrow pit using two main methods, rock breaking and rock blasting. The primary method will be rock breaking. These are discussed below.

2.5.10.1 Rock Breaking

Weaker rock will be extracted using a hydraulic excavator and a ripper. Where stronger rock is encountered and cannot be extracted using an excavator, then rock breaking equipment will be employed. This will typically involve the use of a 40-60 tonne 360-degree hydraulic excavator with a rock breaker. The rock breaker is supported by a smaller 30-40 tonne rock breaker which breaks the rock down further for feeding into the rock crusher machine. The larger rock breaker breaks out the rock in a progressive manner from the borrow pit and the smaller rock breaker breaks it down further.

The broken-down rock is loaded into mobile crusher using a wheeled loading shovel machine and crushed down into the correct grade for use in the construction of Site Access Roads and Turbine Hardstands.

2.5.10.2 Rock Blasting

Where rock is very strong and blasting is required, this is carried out using a mobile drilling rig which is used to drill vertical holes into the rock area that requires blasting. This is where explosives are used. It will take the drilling rig 3 to 4 days to drill the number of holes required for a single blast. A specialist engineer will be employed to determine the locations and depths of blasting required. The specialist blasting engineer will arrange for the correct amount of explosives to be delivered to the Site for each blast. The management of explosives delivery and storage on-site will be agreed with An Garda Síochána in advance. The blast engineer will set the explosives and manage the blast. The rock generated from the blast will usually be the correct size to be loaded directly into the mobile crusher. The effects of blasting on noise are assessed in **Chapter 10: Noise and Vibration.**

2.5.11 Onsite Drainage

The existing surface water runoff is contained within natural and artificial drainage channels that include stream and river waterbodies, drainage ditches, and other minor natural and artificial manmade drainage features.

Drainage measures will be provided to attenuate runoff, guard against soil erosion, soil compaction, and safeguard local water quality. There is a total of 28 No. stilling ponds proposed and located throughout the Site and can be seen on **Figure 2.6**. Details of the

drainage system are shown on **Figures 2.11-2.14** and outlined in detail in the Surface Water Management Plan, part of the CEMP **(Appendix 2.1**). Full details of the proposed drainage are provided in **Chapter 9: Hydrology and Hydrogeology.**

There are three streams in total on Site, made up of one waterbody (Sullane_010). A buffer zone of at least 65 m will be in place for these streams. Where this is not possible for example, at the three watercourse crossings where Site Access Roads will be constructed; construction methods incorporating mitigation measures from this EIAR are set out in **Appendix 2.1: CEMP** and **Appendix 17.1: Schedule of Mitigation Measures.**

Sustainable Drainage System (SuDS) principles namely separation of overland flow from construction areas, the mimicking of diverted overland flow around construction areas and treatment trains to treat water from construction areas, will all be employed as explained in **Chapter 9: Hydrology and Hydrogeology**. Associated controls are listed below:

Source controls for surface water

- Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sandbags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems. Detailed plates and figures of these can be found in **Appendix 2.1**.
- Maintaining small working areas; covering stockpiles with geotextiles to protect against water erosion and runoff in rainy weather, and/or cessation of works in certain areas such as working on a high gradient during wet and windy weather.

In-line controls for surface water

- In line controls are controls which are directly applied to the surface water body including interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds and/or temporary pumping chambers.

Treatment systems for surface water:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbusters.

When heavy rainfall is predicted works will be suspended or scaled back.

It is proposed that all drainage will be left in place upon completion of the construction phase. Full details on drainage management and mitigation can be found in **Chapter 9: Hydrology and Hydrogeology** and the **Surface Water Management Plan** attached as part of the CEMP in **Appendix 2.1**.

2.5.12 Table of Key Development Infrastructure Metrics

The Key Development Infrastructure Metrics are contained in **Table 2.5**. This table is provided for ease of access to these metrics for reference by the personnel writing the other EIAR Chapters. The dimensions of each element of site infrastructure can be seen in Series 100 Site Layout Plans 6226-PL-100-108 Planning Drawings.

Table 2.5: Key Development Infrastructure Metrics

Description	Length (m)	Width (m)	Depth (m)	No.	Area (m^2)	Volume of Excavation (m^3)
Upgraded Site Access Road	3,102	2.00	0.60	1	6,203	3,722
New Site Access Road	3,555	4.50	0.60	1	15,998	9,599
Off-site Road Upgrade Nodes	-	-	0.60	1	1,118	671
Turbine Hardstands – cranes	-	-	1.20	5	23,700	28,440
Turbine Foundations (25.5 m diameter)	-	-	2.85	5	3,064	8,732
Met Mast foundation	10	10.00	2.25	1	100	225
Electrical Substation	-	-	0.60	1	1,314	788
Site Compound	70	52.00	0.60	1	3,640	2,184
Internal Cabling	4,743	0.45	1.00	1	2,134	2,134
110 kV Cable Trench	4,743	0.60	1.34	1	2,846	3,813
Joint Bays	6	2.50	2.00	18	270	540
Link box	2	1.25	1.00	18	45	45
Comms box	1	1.03	1.29	18	19	24
Drainage	-	-	1.00	1	2,368	2,368
Borrow Pit	-	-	1.30	1	38,674	50,276

Table 2.6: Summary of Estimated Excavation Quantities (m^3)

**All excavated materials will be disposed of at a licensed facility*

Excavated Material Type	Excavated Material Volume (m^3)	Proposed Re-Use Volume	Comments
Roads	15,876	13,321 m^3 peat 2,556 m^3 subsoil	Peat and subsoil material will be used to reinstate the onsite borrow pits.
Turbine Foundations	7,250	1,562 m^3 peat 3,083 m^3 subsoil 2,605 m^3 rock	Peat will be used as backfill to foundations. Any surplus will be used to reinstate the borrow pits after extraction. Subsoil will be deposited locally adjacent to Turbine Bases. 144 m^3 will be used as berms around Turbines. Any surplus will be used to reinstate the borrow pits after extraction. Rock will be crushed and used as hardcore in Site Access Tracks and Turbine Hardstands.
Turbine Hardstands	41,949	14,220 m^3 peat 27,729 m^3 subsoil	Peat and subsoil are to be deposited locally at hardstand edges. 360 m^3 will be used as berms around Turbine Hardstands. Any outstanding peat will be air dried and used to fill borrow pits.
Electrical Sub-Stations & temporary Compounds.	9,907	1,385 m^3 peat 8,522 m^3 subsoil 0 m^3 rock	Peat is to be temporally stored and re-used to reinstate the Temporary Compound Areas. Subsoil will be dried and used to reinstate the borrow pits after extraction
Grid Connection*	6,854	0 m^3 peat 6,557 m^3 subsoil 297 m^3 rock	To be disposed of at a licensed facility (LoW 17 05 03*, 17 05 04) Please see Waste Management Plan for more details

Excavated Material Type	Excavated Material Volume (m^3)	Proposed Re-Use Volume	Comments
Drainage	2,280	2,280 m^3 peat	Peat is to be temporally stored and re-used to reinstate the Temporary Compound Areas.

2.6 CONSTRUCTION

The first phase of the Development will comprise the construction phase. This phase will begin with site preparation works and will be complete when the turbines are built and ready for commissioning, and when all wastes have been removed from the site. For this Development, it is envisaged that the construction phase will last approximately 21 months, with commissioning taking a further three months. An indicated construction programme is set out at **Table 2.7**.

2.6.1 Construction Sequencing

It is envisaged that the following will be the sequence of construction for the Development:

1. Site Preparation including felling and drainage (e.g., stilling ponds);
2. Site Roads and further tree felling;
3. Contractor Compound and Welfare Facilities;
4. Turbine Hardstands, Turbine Foundations, met mast foundations, Internal cable ducting, 38 kV substation;
5. Installation of the Grid Connection;
6. Erection of wind turbines and met mast;
7. Commissioning and Energisation.

The first step will be to prepare the Site for construction. This will include felling and implementing the designed drainage measures for all site infrastructure. The Site Access Roads will then be constructed and/or upgraded. The next step will be to construct the Temporary Construction Compound and Welfare Facilities. The next step will be to prepare the areas of the site where site infrastructure is to be located by marking out the construction works corridor, the relevant environmental buffer zones.

Following the site preparation, construction of the crane hard-standing areas for the five turbines will occur. The five Turbine Foundations will then be excavated and foundations constructed using reinforcing bar (rebar) and imported concrete. No concrete batching will take place on site.

Following the construction of the Turbine Foundations, internal cable ducting from the turbine locations to the on-site 38 kV substation will be laid in trenches along the constructed access roads.

The Grid Connection Route will then be constructed. There will be 19.9 km of trenches for underground cabling (UGC) to Ballyvouskil 220 kV substation. The ducts to be installed in an excavated trench which will be 600 mm wide and 1 m deep. There will be variations on this design to adapt to bridge crossings, service crossings and watercourse crossings as per TLI Technical notes included in **Appendix 2.4**.

The last step will be to erect the five wind turbines on the foundations using two cranes. Commissioning and testing of the turbines can then proceed.

Table 2.7: Indicative Construction Programme

Activity	Month																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Site Establishment/Felling and Fencing	X	X	X	X																X	
Internal Access Road Upgrade & Construction		X	X	X	X	X	X			X	X									X	
Substation & Compound Construction		X	X	X	X	X	X	X													
Substation Electrical Works									X	X	X	X	X	X	X	X	X				
Substation Commissioning																X	X				
Excavation & Construction of Turbine Foundations & Hardstands		X	X	X	X	X	X	X	X	X	X										
Internal Cabling Installation										X	X	X	X	X	X	X					

Activity	Month																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Turbine Delivery and Erection											X	X	X	X	X	X					
Grid Connection						X	X	X	X	X	X	X	X	X	X	X	X				
Energisation																		X			
Turbine Commissioning																			X	X	X
Site Restoration																		X	X	X	X

2.6.2 Construction and Environmental Management Plan (CEMP)

A CEMP is appended to the EIAR in **Appendix 2.1**. The CEMP includes an Emergency Response Plan, Peat and Spoil Management Plan, Surface Water Management Plan, Water Quality Management Plan, Waste Management Plan, Decommissioning Plan and Traffic Management Plan. The CEMP includes all the mitigation measures proposed within the EIAR and the NIS related to the Construction Phase. A Summary of all the mitigation measures of the EIAR is also included in **Appendix 17.1**.

The CEMP provides a commitment to mitigation and monitoring and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Development will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final decommissioning phases. An Environmental Manager / Ecological Clerk of Works (ECoW) with appropriate experience having completed a similar role will be appointed for the duration of the construction phase so that the CEMP is effectively implemented.

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

The following sections describe key activities which, if unmitigated against, may cause harm or nuisance to the public. The potential impacts of each are considered in each chapter of this EIAR.

2.6.3 Refuelling

Vehicles will be refuelled off-site where possible. For vehicles that require refuelling on-site, fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axle refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry, a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site.

2.6.4 Concrete

There will be no concrete batching on the Site. Rather, it will be transported to the Site as it is required. A dedicated, bunded area will be created to cater for concrete wash-out and this will be within the temporary construction compound located to the north-east of T3. This will be for the wash-out of the chutes only after the pour. Concrete trucks will then exit the Site and return to the supply plant to wash out the mixer itself.

The main concrete pours at the turbine locations will be planned in advance and proposed mitigation measures (detailed in **Chapter 9: Hydrology and Hydrogeology**) are summarised as follows:

- Avoiding large concrete pours, for Turbine Foundations for example, on days when heavy or prolonged rainfall is forecast i.e., 25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or rainfall depth greater than monthly average in seven days (prolonged heavy rainfall over a week). Concrete pouring will be avoided during a period in which a Met Éireann Status Red weather event has been implemented
- Ensuring that all concrete pour areas are dewatered prior to pouring concrete and while the concrete is curing
- Making covers available so that areas can be covered if heavy rain arrives during the curing process which will prevent runoff of concrete which has a high pH

2.6.5 Dust Suppression

During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network (assessed in **Chapter 10: Air and Climate**). Damping down of internal roads and other site infrastructure will be required in this instance to see that dust does not become friable. This is most likely to occur during periods of dry and/or windy weather. This requires wetting the material and ensuring water is supplied at the correct levels for the duration of the work activity.

To reduce mud and debris from getting onto the local road network, a wheel wash facility will be employed at the site exit which will wash mud and debris from vehicles egressing the Site.

Where rock is sourced from off-site (see locations in **Figure 15.3**), HGVs entering the Site carrying rock will be covered to prevent dust generation. A road sweeper will be available for use in case of any mud or debris making it onto the public road network.

2.6.6 Construction Hours

The Development will have approximately 25 construction workers during the peak of the construction phase. Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. It should be noted that during the turbine erection phase, operations will need to take place outside those hours with concrete pours commencing at 05:00 and continuing till 16:00, to facilitate Turbine Foundation construction and so that lifting operations are completed safely. Hours of working for Turbine Foundation construction will be agreed with Cork County Council prior to the commencement of Turbine Foundation construction. **Chapter 15: Traffic and Transportation** refers to this in further detail. A detailed Traffic Management Plan (**Appendix 2.1**) will be implemented during the construction phase.

2.6.7 Construction Compound and Temporary Works Area

The temporary construction compound will be set up upon commencement of the construction phase. The proposed location for the temporary construction compound is north-east of T3 as shown in **Figure 2.15** and the layout is shown in **Figure 2.16**. The compound will be 70 m by 50 m and will comprise a stoned platform 0.6 m in depth [3,500 m^2 / 2,100 m^3]. The compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for staff welfare facilities. The compound will contain cabins for offices space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel facilities.

An area within the compound will be used for the storage of fuel and oils and this will be suitably bunded and the bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays and details are included in the CEMP, included as **Appendix 2.1**.

During the construction phase, water will be supplied to the temporary compound by water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption (2,000 litres per day)[3]. The project will include an enclosed wastewater management system at the temporary compound to deal with wastewater arising from staff (**Figure 2.16**) and capable of handling the demand during the construction phase with 25 construction workers on site at peak. A holding tank is proposed for wastewater management. Wastewater will be removed off-site weekly, by a licensed wastewater disposal company and disposed at an appropriate licenced facility, likely to be in Ballyvourney/Ballymakeera.

2.6.8 Construction of Crane Hardstands and Foundations

The construction method for all the crane hardstands will be via excavated approach. Each crane hardstand will be 4,670 m^2. Foundations will be taken down to competent bearing strata by excavating through the soil, subsoil, and rock if necessary.

The method of construction for Turbine Foundation is described below:

- Install drainage around perimeter of excavation (see **Chapter 9: Hydrology and Hydrogeology** for full details of proposed drainage);
- Excavate soil and rock and temporarily store adjacent to the works;
- Form a level working area to build foundation;
- Install formwork and reinforcement;
- Pour concrete;
- Cure concrete;
- Once the concrete has set and the earthing system is in place, backfill the foundation with rock, and
- Use excavated soil to build up the area around the turbine base.
- The remaining volume of excavated material is to be used to reinstate the borrow pit.

2.6.9 Construction Turbine Assembly

Once on Site, the wind turbine components will follow a prescribed route to minimise manoeuvring. Components will be placed on Turbine Hardstands prior to assembly. A 'just in time' delivery strategy will be in place for turbine blades to reduce the need for temporary set down areas. One large crane will be required for erecting the turbines, assisted by a smaller crane. The same number of cranes will also be required during the operational phase for maintenance and replacement works.

[3] Table 3 of the EPA WW treatment Manual (Treatment systems for Small Communities, Business, Leisure Centres and Hotels), Environmental Protection Agency, 1999. Quarry (excluding canteen) best reflects a construction site.
[Available online: https://www.epa.ie/publications/compliance--enforcement/wastewater/EPA_water_treatment_manual_-small-comm_business.pdf]

The towers will be delivered in sections, and work on assembly will not start until a suitable weather window is available, e.g., Wind Gust Speed Threshold of less than 6 ms^{-1}. The bottom tower section will be bolted onto the concrete foundations. The mid tower section will then be lifted into position and bolted to the bottom tower section. Finally, the top tower section will be lifted into position and bolted to the mid tower section. Three methods can be used to attach the blades:

1. The blades can be attached to the nacelle and hub on the ground. The hub and blades are then lifted as one. The nacelle of a wind turbine houses the drive train and other tower-top components. The hub of the wind turbine connects the blades to the main shaft and ultimately to the rest of the drive train.
2. The hub can be attached to the nacelle and the two blades attached to the hub while the nacelle is on the ground – the "bunny lift". The nacelle is then lifted into position and the third blade lifted into place separately. This requires manoeuvring of several components on the ground and usually the repositioning of cranes.
3. Lifting the nacelle and hub as one unit, as described above and then attaching the blades one at a time, rotating the hub between lifts. The blade lifting operations do not require repositioning of the crane.

The most appropriate method will be decided by the lifting contractor and the turbine manufacturer, prior to turbine erection.

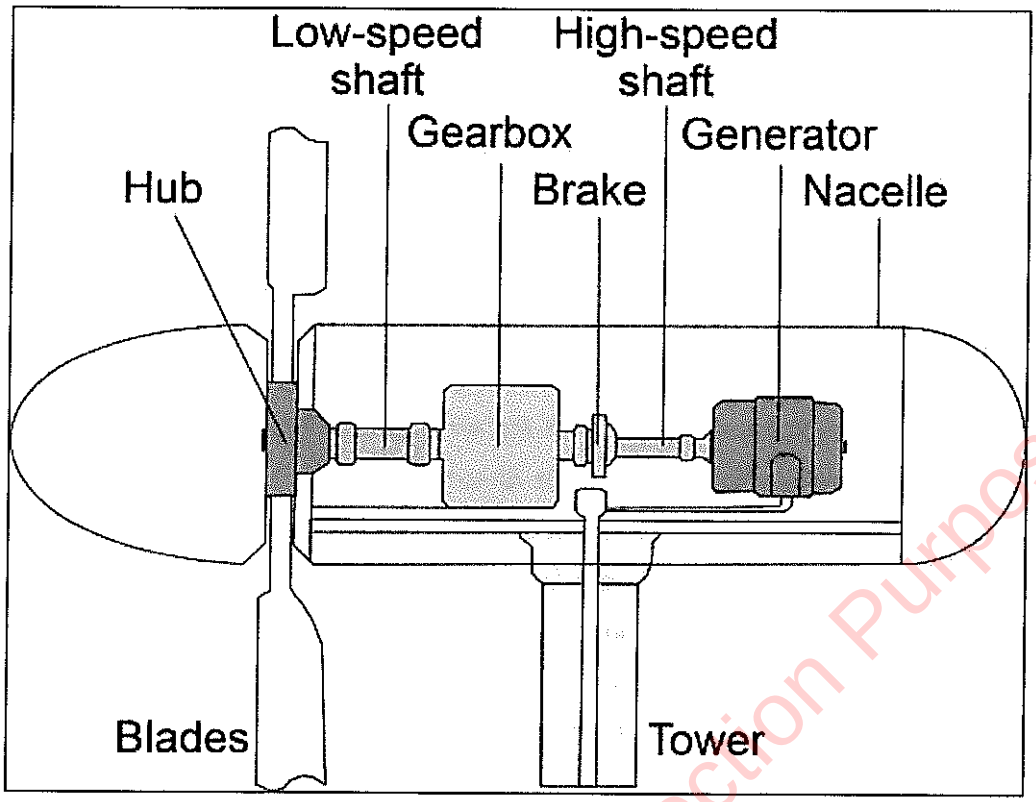


Plate 2.1: Turbine components[4] Source: (University of Michigan, 2022)

2.6.10 Construction Traffic

It is estimated in **Chapter 15**, that during civil construction, 1,781 fully loaded Heavy Goods Vehicle trips will be required for the Development. This breaks down to 162 loads per month or an average of 7 to 9 loads per day.

The peak number of deliveries per day will occur during the concrete pour for Turbine Foundation construction. An estimated 140 concrete deliveries will be required per Turbine Foundation. Other materials will also be delivered on such days, so a realistic estimation of peak deliveries is 150 deliveries per day (for at least six separate days in the construction programme when the Turbine Foundations will be poured). On these concrete pour days, 14-18 deliveries per hour will be required.

2.6.11 Reinstatement and Monitoring

Following completion of construction, all plant and machinery will be removed from the Site. The construction compound and other temporary works/assembly areas needed for the construction period, will be reinstated using the original spoil material removed and

[4] (Michigan, 2022)
University of Michigan, 2022. *Center for Sustainable Systems.* [Online]
Available at: https://css.umich.edu/publications/factsheets/energy/wind-energy-factsheet
[Accessed 29 August 2022].

stockpiled close to the location from where it was excavated as explained in **Chapter 5: Terrestrial Ecology** and **Chapter 8: Soils and Geology**. Stockpiles will be restricted to less than 2 m in height and located outside of the surface water buffer zones. All stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW).

The grid route will be completed as described in Section 2.5.9.

All on-site installed drainage network will be left in place. This will be monitored on a quarterly basis to see that it is operating to its stated design purpose. Water monitoring on nearby natural watercourses will be undertaken prior to, during and post construction to determine if any pollution has migrated off-site, and if so, implement measures to rectify the impact. Details of this can be found in **Chapter 9: Hydrology and Hydrogeology.**

There will be no reinstatement works required during the decommissioning phase.

2.6.12 Construction Supervision and Monitoring

The construction activities will be monitored by a Site Engineer, Geotechnical Engineer, a qualified archaeologist and an Ecological Clerk of Works (ECoW).

The Geotechnical Engineer will be contracted for the detailed design phase and their services retained throughout the construction and reinstatement phases. The Geotechnical Engineer will oversee all earthworks and excavation activities and monitor for issues such as ground stability, water ingress into excavations etc. Roles and responsibilities are further detailed in **Appendix 2.1**.

Daily monitoring of excavations by the Geotechnical/Site Engineer will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken. Further details of what this will involve are detailed in **Chapter 8: Soils and Geology** and **Chapter 9: Hydrology and Hydrogeology**.

The ECoW will be employed prior to the commencement of the construction phase to monitor and review the pollution control measures and working practices during construction and have input into site remediation. The ECoW will have stop work authority if, for example, a sensitive habitat feature is encroached upon or there is the possibility of silt/pollution runoff to natural watercourses.

The potential exists for the presence of unrecorded, sub-surface archaeological features within green field locations in proposed construction areas within the Site. A series of construction phase archaeological investigations under licence by the National Monuments Service will be carried out by a suitably qualified archaeologist. The archaeologist will have responsibility for ensuring that potential archaeological features are protected should any be discovered during excavations. The Site will be accessible to the appointed archaeologist at all times during working hours and the nominated archaeologist will monitor all invasive works.

If any sub-surface archaeological remains are identified during site investigations, they will be cleaned, recorded and left to remain *in situ* within cordoned off areas while the National Monuments Service are notified and consulted in relation to appropriate future mitigation strategies, which may entail preservation *in situ* by avoidance or preservation by record by archaeological excavations.

Water monitoring details are included in **Management Plan 2: Water Quality Management Plan** as part of **Appendix 2.1** and will be implemented prior to commencement of construction. Regular inspections of the installed drainage system will be undertaken by the Ecological Clerk of Works, especially after heavy rainfall events, to check blockages and see that there is no build-up of standing water in any part of the system where is it not designed to be.

Excess build-up of silt will be removed at check dams, attenuation/settlement ponds or any other drainage feature by scraper or excavator and under the supervision of the ECoW. During the construction phase, field testing and laboratory analysis of a range of parameters with relevant regulatory limits and Environmental Quality Standards will be undertaken for each watercourse close to the site, and specifically following heavy rainfall events (i.e., weekly, monthly and event based). The locations and are included in **Chapter 9: Hydrology and Hydrogeology**.

The CEMP for the Development sets out the proposed site organisation, sequencing of works, methodologies, mitigation measures and monitoring measures.

The local road network near the Site is used to transport construction materials and will be monitored during construction, so that any damage caused by construction traffic associated with the Development can be identified and repaired, as local roads are more prone to damage than national roads. This monitoring will be undertaken on the N22 and at

the Development entrance. Readymix concrete will be sourced from local quarries when required (see locations in **Figure 15.4**) and monitoring, such as visual inspections, will also be undertaken on the route from these, as required. This is detailed and assessed in **Chapter 15: Traffic and Transportation.**

2.6.13 Construction Employment

Based on our experience, it is estimated that between 36 and 63 direct and indirect jobs could be created during the construction phase of the Project. It is not expected that all of these jobs will be based at the Site.

2.7 COMMISSIONING

Wind farm commissioning can take in the region of three months to complete from the erection of the final turbine to the commercial exportation of power to the national grid. It involves electrical and mechanical testing and control measures to check that the wind farm will perform and export power to the national grid, as designed and commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition).

2.8 OPERATION AND MAINTENANCE

During the operation of the wind farm, the turbine manufacturer, the wind farm operator, or a service company will carry out regular maintenance of the turbines, substation and site infrastructure. Personnel will enter the site via the site entrance at the N22. Monthly routine inspection and preventative maintenance visits will be necessary to provide for the smooth and efficient running of the wind farm. This will occur over one day with one vehicle attending the Site. In addition, operation and monitoring activities will be carried out remotely with the aid of computers connected via a telephone broadband link.

The permanent site infrastructure can be utilised in the event that replacement turbine components are required, such as a new blade.

2.9 DECOMMISSIONING

The Applicant is applying for a consent for a period of 35 years for the operation of the wind farm. The full description of the decommissioning is as follows:

- Removal of five wind turbines and above ground concrete plinths.
- Removal of above ground meteorological mast structure.
- Removal of all associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation. Ducting is to remain *in-situ.*

All other elements of the proposed development including the on-site substation, will remain in-situ. The Site Access Roads and associated drainage systems will serve ongoing forestry and agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the EIAR project team of monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful and less environmentally impactful than removing this infrastructure.

Cranes of similar size to those used for construction will disassemble each turbine using the same crane hardstands. The towers, blades and all above ground components will be removed from site and reused, recycled, or disposed of in a suitably licenced facility. Turbine parts will be cut on site so as to fit on articulated trucks (The financial costs of decommissioning, at current material values, will be more than met by the recycling value of the turbine components).

Potential impacts will be similar to that of the construction phase, albeit to a lesser extent and are described in each chapter of this EIAR.

A decommissioning plan is included as part of the CEMP in **Appendix 2.1**. Prior to the decommissioning works, a plan will be submitted to the planning authority for written agreement. The plan will take account of contemporary best practice.

2.10 COMMUNITY BENEFIT

In addition to helping Ireland reduce environmentally damaging fossil fuel emissions and helping avoid significant fines from the EU, Inchamore Wind Farm will also contribute positively to the national and regional economy.

A SEAI report indicated that in 2019 wind energy generated 32% of all electricity, avoided 3.9 million tonnes of CO_2 emissions; and avoided approximately €260 million in fossil fuel imports[5]. Additionally, 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."[6]

[5] https://www.seai.ie/publications/Energy-in-Ireland-2020.pdf [Accessed 08/02/2022]
[6] https://windenergyireland.com/images/files/baringa-wind-for-a-euro-report-january-2019.pdf [Accessed 08/02/2022]

In addition to the above financial costs and benefits, the Barringa report outlines that wind generation in Ireland avoids:

"33 million tonnes of power sector CO_2 emissions. The total carbon emissions from electricity generation in 2017 was 11.7 Mt, so a saving of 33 Mt is equivalent to almost 3 years of total carbon emissions in the electricity sector today. 137 TWh of fossil fuel consumption at a saving of €2.7bn. In comparison, Ireland consumed 44 TWh (3814 ktoe) of fossil fuels for electricity generation in 2017, so a saving of 137 TWh is equivalent to 3 years of current fossil fuel consumption for electricity generation."

The Project has the potential to bring significant positive benefits to local communities. It will support sustainable local employment; it will contribute annual rates between €280,000 to €330,000 to the local authority; and it will provide opportunity for local community investment in the project in line with the new Renewable Energy Support Scheme (RESS). This is a Government of Ireland initiative that provides support to renewable energy projects in Ireland. A Community Benefit Fund will be put in place for the RESS period (i.e., 15 years of the operation) of the Project to provide direct funding to those areas surrounding the Project. The significant annual community benefit fund will be established in line with Government policy which will include funding for both wider community initiatives and a Near Neighbour scheme focused on houses in close proximity to the Project.

It is anticipated that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the RESS period i.e., first 15 years of operation. If this commitment is improved upon in upcoming Government Policy, this will be adjusted accordingly.

The Project has the potential to contribute between €170,000 and €200,000 e per annum in the local area for community funding for the RESS period, consistent with Government Policy. However, the above figure is indicative only and is and will be dependent on the generation capacity of the wind farm which is influenced by a number of factors including:

- Number and type of wind turbines permitted
- Capacity and availability of energy production of the delivered turbines
- Quantity of wind and wind conditions in any given year

2.10.1 Fund Usage and Administration

The Community Benefit Fund belongs to the local community surrounding the Development. The premise of the fund is that it will be used to bring about significant, positive change in the local area. To make this happen, the first step will be to form a benefit fund development

working group that clearly represents both the closest neighbours to the Project as well as nearby communities. Workshops will be organised to facilitate consideration of the priorities for the local fund. This group will then work on designing the governance and structure of a community entity that will administer the Community Benefit Fund.

It is acknowledged that the people living closest to a wind farm are the most important stakeholders and a proportion of the Community Benefit Fund will be set aside as a dedicated "Near Neighbour Fund". The exact structure of this will be confirmed as part of the development of the overall Community Benefit Fund but would typically provide support of varying degrees for properties up to 2 km from turbines. This is supported by the requirements set out in the RESS2 and may be adjusted in future RESS schemes that may relate to this Project.

2.10.2 Community Investment

The Renewable Energy Support Scheme (RESS) - RESS-2[7] sets out that future renewable energy project proposals will enable the possibility for local communities to invest in projects in a meaningful way as a means to directly gain from the financial dividends that a project can provide should it be consented, built and operated.

This element was not included in the RESS-1 or RESS-2 Schemes but it is expected to form part of later RESS-3 Scheme which likely will apply to this Project. In preparation for this, the Developer has been working with external agencies to develop workable models of Community Investment.

7 https://www.gov.ie/en/publication/7f0bb-renewable-electricity-support-scheme-2-ress-2/, Accessed 20/01/2022.

3 ALTERNATIVES CONSIDERED

3.1 INTRODUCTION

This Chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the reasonable alternatives studied by the Developer, which are relevant to the Project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the Project on the environment. Alternatives were assessed taking commercial, construction, operational and key environmental constraints into consideration.

3.2 STATEMENT OF AUTHORITY

This chapter has been prepared by Ms. Sarah Moore with the assistance of Ms. Shirley Bradley of Jennings O'Donovan & Partners Limited.

Ms. Sarah Moore is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Environmental Science from University of Limerick and a MSc (Dist.) in Environmental Engineering from Queen's University, Belfast. She has worked in environmental consultancy for over fourteen years and has prepared AA Screenings, Environmental Reports and wind farm EIARs, including the consideration of alternatives.

Ms. Shirley Bradley is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities are in report writing, assisting Senior Consultants and GIS.

3.3 METHODOLOGY

3.3.1 Requirements for Alternatives Assessment

Annex IV of the EIA Directive as amended (Information Referred to in Article 5(1) (Information for the Environmental Impact Assessment Report) elaborates as follows:

"2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".

The Environmental Protection Agency (2022) states that "*It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each,*

showing how environmental considerations were taken into account in deciding on the selected option".

The EPA guidance documents on EIAR preparation[1] [2], stipulates the following:
"The presentation and consideration of the various alternatives investigated by the applicant is an important requirement of the EIA process…. and the alternatives can include:

- *alternative locations;*
- *alternative designs; and*
- *alternative processes*".

The objective is for the Developer to present a description of the reasonable alternatives studied by the Developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.

In an effective EIA process, different types of alternatives may be considered at several key stages during the process. As environmental issues emerge during the preparation of the EIAR, alternative designs may need to be considered early in the process or alternative mitigation options may need to be considered towards the end of the process. These various levels of alternatives are set out in chapter.

Taking the legislative and guidance requirements into account, this chapter addresses alternatives under the following headings:

- 'Do Nothing' Option
- Strategic Site Selection
- Alternative Wind Farm Design and Layout
- Alternative Turbine Numbers and Specifications
- Alternative Grid Connection
- Alternative Renewable Energy Technologies
- Alternative Turbine Haul Route
- Alternative Mitigation Measures

[1] EPA. (2002). Guidelines on the information to be contained in Environmental Impact Statements.
[2] EPA. (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.

When considering a wind farm development, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.3.2 Approach to Alternatives

The Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017) states that reasonable alternatives *"must be relevant to the proposed project and its specific characteristics, and resources should only be spent on assessing these alternatives" and that "the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative".*

3.4 'DO-NOTHING' ALTERNATIVE

Annex IV, Part 3 of the EIA Directive as amended requires a *"description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge."* This is referred to as the "do nothing" alternative. EU guidance (EU, 2017) states that this should involve the assessment of "an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario'."

Ireland has adopted binding agreements to reduce dependency on fossil fuels and increase energy production from sustainable sources, creating a requirement for the nation to transition to a low carbon economy. The binding EU targets have been transposed into Irish National Policy in the 2023 Climate Action Plan which focuses up to 9 GW future electricity production on the wind energy sector. This demonstrates the significance of wind energy in the Irish energy context and highlights the need for the proposed Inchamore Wind Farm in reaching both EU and national renewable energy targets.

Ireland is obliged to ensure that 32% of the total energy consumed in heating, electricity and transport is generated from renewable resources by 2030 and reduce its greenhouse gas emissions by at least 55% by 2030, relative to its 1990 levels, with an overall objective of carbon neutrality by 2050. This is in order to help reduce the nation's CO_2 emissions and to promote the use of indigenous renewable sources of energy. These targets have been incorporated into national policy in the Climate Action Plan (2023) which aims to:

- Reduce CO_2 eq. emissions from the electricity sector by 62-81%.
- Deliver an early and complete phase-out of coal and peat fired electricity generation. (Note although peat-fired electricity generation has ceased in Ireland, coal and oil fired plants are still operational. Tarbert Power Station (620 MW) was supposed to close by 2023, and Moneypoint Power Station (915 MW) was supposed to close by 2025. This is now delayed arising from concerns about security of electricity supply. This delay means that more carbon emissions will arise. It highlights the urgency of constructing this and other wind farms).
- Increase electricity generated from renewable sources to 80%, indicatively comprised of:
    - Up to 9 GW onshore wind energy.

Furthermore, the Climate Action and Low Carbon Development (Amendment) Act (2021) will act to reduce 51% emissions over a ten-year period to 2030, in line with the programme for Government which commits to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieving net zero emissions by 2050.

Under a 'Do Nothing' alternative, the Project will not be constructed. The land upon which Project will occur would remain unchanged. The main land use of the Site would remain as commercial forestry and agriculture. Consequently, the environmental impacts, identified in the EIAR, positive and negative, would not occur. However, 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 Development has the potential to prevent approximately between 30,038 and 35,373 tonnes of CO_2 emissions per annum, or between 1,051,334 and 1,238,059 tonnes of CO_2 emissions will be displaced over the proposed 35 year lifetime of the wind farm, see **Chapter 10: Air and Climate** for details on the Carbon Calculator method. This would otherwise be released to the atmosphere through the burning of fossil fuels in the "Do-Nothing" scenario. This would not assist in Ireland's contribution to reducing global warming and would fail to limit warming as agreed to in the Paris Agreement (2015). This will result in continued negative impacts to air quality and climate.

According to EirGrid Group's All-island Generation Capacity Statement 2021 – 2030 (EirGrid, 2021), the growth in energy demand for the next ten years on the Island of Ireland will be between 18% and 43%. In the 'Do-nothing' scenario, importation of fossil fuels to maintain growing energy supply will continue and Ireland's energy security will remain vulnerable. A "Do-nothing" scenario would contribute to strain on existing energy production and may impact on economic growth if energy demand cannot be met. The delay in closing Tarbert and Moneypoint means we continue to rely on imported fossil-fuels with unpredictable pricing, a vulnerable supply chain and higher carbon emissions.

Under the "Do-Nothing" scenario, the socio-economic benefits associated with the Project will be lost. These benefits include between 25 to 30 No. jobs during the construction phase of the project, and between 2 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 within the vicinity of the Project.

The potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this Site are presented in **Table 3.1**. Refer to each respective chapter for full details of residual impacts.

Table 3.1: Environmental effects of 'Do-Nothing' compared with a wind farm development

Criteria	Residual Impact of the Project	Do-Nothing Alternative
Population & Human Health (incl. Shadow Flicker)	Long-term positive economic benefit to local area due to job creation and Community Benefit fund.	No increase in local employment and no financial gains for the local economy or community via the community benefit fund. No upgrading of local forest tracks or creation of new tracks which can be used for walking and mountain biking. No potential for shadow flicker or noise to affect sensitive receptors.
Terrestrial Ecology	Slight negative impact on Annex 1 listed habitats. Overall positive benefit due to proposed biodiversity enhancements.	The ecology of the Site would be expected to remain similar as at present though any increase in grazing pressure could be detrimental to the quality of peatland habitats within the site. Also, any further afforestation on heath and bog habitats would be detrimental.

Criteria	Residual Impact of the Project	Do-Nothing Alternative
Aquatic Ecology	There will be no negative residual impact on any aquatic species, habitat or on water quality at a local or catchment level as a result of the Development.	If the development does not proceed, lands at and in the vicinity of the Site will continue to be used for forestry and agricultural purposes. This 'Do-Nothing' scenario would result in no significant change to aquatic ecology and habitats within or downstream of the Site subject to the continuation of current activities and practices.
Ornithology	Slight negative impact on birds following implementation of mitigation measures.	Without the proposed wind farm development proceeding, it is expected that the present main land uses on Site, namely livestock grazing and forestry, will continue. It is possible that further afforestation would occur on the Site in the future. The value of the Site for birds would be expected to remain similar as at present though any increase in grazing pressure could be detrimental to the quality of peatland habitats of the Site which could affect species such as Red Grouse. Also, any further afforestation on heath and bog habitats would be detrimental to peatland bird species, including Red Grouse, Meadow Pipit and Skylark.
Soils & Geology	The residual impacts on the soils and geology environment as a function of the Development is that there will be a change in ground conditions at the Site with natural materials such as peat, subsoil and bedrock being replaced by concrete, subgrade and surfacing materials. This is a localised, negative, moderate significance at a local scale	Should the proposed development not proceed, the existing land-use practices will continue with associated modification of the existing environment, including the underlying soils and geology, through agriculture and commercial forestry.
Hydrology & Hydrogeology	Non-significant impacts following implementation of mitigation measures.	Should the proposed development not proceed, the existing land-use practice of commercial afforestation and agricultural activities will continue with associated gradual alteration of the existing environment and associated pressures on surface water and groundwater quality.

Criteria	Residual Impact of the Project	Do-Nothing Alternative
Air & Climate	Long-term positive impact on air quality and climate due to avoidance of burning of fossil fuels and the net displacement of between 30,038 and 35,373 of CO_2 per annum.	There will be no increase in air quality or a reduction of greenhouse gas emissions. By the Development not proceeding it will not assist in achieving the renewable energy targets set out in the Climate Action Plan. As a result, fossil fuel power stations will be the alternative to provide the required quantities of electricity resulting in greenhouse gas and other air pollutant emissions.
Noise	Non-significant to slight temporary noise impacts associated with construction activities. Temporary moderate impact along the grid route at certain dwellings during construction. The operational noise impacts are imperceptible.	There will be no change in noise emissions.
Landscape & Visual	The scale of the proposed development will be well assimilated within its landscape context without undue conflicts of scale with underlying landform and land use patterns. For these reasons the magnitude of the landscape impact is deemed to be **High-medium** within the Site and its immediate environs (c.1 km) reducing to **Medium** and then **Medium-low** for the remainder of the central study area. Beyond 5 km from the Site, the magnitude of landscape impact is deemed to reduce to **Low** and **Negligible** at increasing distances as the wind farm becomes a proportionately smaller and integrated component of the overall landscape fabric.	In this instance, the existing forestry plantations contained within the Site would continue to be planted and felled in rotation in the do-nothing scenario. As this aligns with the current scenario, no additional landscape or visual impacts are likely to occur.
Material Assets	Positive impact by offsetting use of fossil fuel. Positive impact due to provision of electricity infrastructure.	No offset to fossil fuel use. No provision of additional renewable electricity generation infrastructure in the local area.
Cultural Heritage	No residual impacts.	There will be no potential for Cultural Heritage impacts.
Traffic and Transportation	Moderate localised short-term impact due to construction and decommissioning activities.	There will be no potential for Traffic and Transport impacts.

3.5 STRATEGIC SITE SELECTION

3.5.1 Strategic Site Screening

The Project Developers, FEI and SSE, continuously examine the lands under their stewardship for candidate sites for wind energy development.

There have been two main screening exercises undertaken by Coillte's Renewable Energy Development Team (now FEI) one in 2014 and one in 2017. The purpose of the site identification exercise was to identify an area that would be capable of accommodating a wind farm development while minimising the potential for adverse impact on the environment. To satisfy this requirement, a significant landholding that would yield a sufficient viable area for the siting of each element of the Development was required.

In 2014 Coillte's Renewable Energy Development Team (now FEI) undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as forestry data, ordnance survey land data, house location data, transport, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time.

The following is a summary of the methodology used in this screening process:

Phase 1 – Initial Screening

This stage in the selection process discounted lands that were not available for development under a number of criteria, as follows:

1. Committed Lands for other developments
2. Millennium Sites (This is a Coillte environmental designation – these sites were planted and managed for provision of a tree for every household in the country as part of the Millennium tree planting project)
3. Life Site (This is a Coillte environmental designation – these former forested sites were cleared and are managed for biodiversity)
4. Wild Nephin Properties (This is a Coillte designation. Since 2014 these properties have been incorporated into National Parks)
5. Farm Partnerships and Leased Lands
6. National Parks
7. Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA)

Coillte also reviewed the relevant local authority's County Development Plan (CDP) and/or Renewable Energy Strategy (RES) provisions and did not proceed with further analysis where the policy context was not supportive of wind farm development. In this regard, areas were not brought forward for further analysis if they were not identified as being at least "open for consideration" for wind farm development.

Lands where the average wind speed at 80 metres above ground level was less than 7 meters per second and was therefore, potentially not suitable for a commercially viable wind energy development were also discounted at this stage. In addition, sites with a contiguous area of less than 300 hectares were discounted.

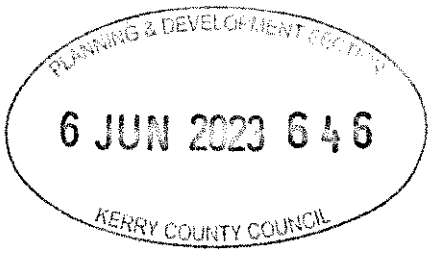
Phase 2 – Grid Constraints

The electricity transmission system is the backbone of the nation's power system, efficiently delivering large amounts of power from where it is generated to where it is needed. As part of the Site selection process, it was necessary to consider in principle the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

Phase 3 – Screening

The next stage of screening out lands from further analysis was due to the presence of the following:

1. Sensitive Amenity or Scenic Areas designation in CDPs (at the time of the screening process);
2. Lands utilised for other wind farm developments;
3. Telecommunications masts and links;
4. Sensitive habitat/species of bird;
5. Land Ownership title issues;
6. Relatively high residential density in vicinity;
7. Unfavourable slopes and ground conditions.



This stage of screening was generally applied using in-house expertise and local knowledge and was subsequently validated externally in terms of the engineering considerations and the likelihood of obtaining a successful grant of planning permission based on industry trends in 2014.

Results of the Screening Process

Sites that emerged from the 2014 site selection process described above are listed below and have been brought forward as separate planning applications alone or with co-development partners:

- Croagh, Co. Leitrim;
- Carrownagowan, Co. Clare;
- Glenard, Co. Donegal;
- Bottlehill (Coom), Co. Cork;
- Castlebanny, Co. Kilkenny (consented).

Each is a project in its own right and is subject to EIA. As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regard to their environmental impacts is provided in the EIAR accompanying applications.

In 2017 Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above but this time reducing the required contiguous Site area from 300 ha to 50 ha. The proposed Inchamore Site emerged from this process and the process described in Section 3.5.1 below. Other sites which also emerged and for which FEI are in the process of preparing separate planning applications or are in the planning system are:

- Ballinagree, Co. Cork;
- Croaghaun, Co. Carlow;
- Cummeennabuddoge, Co. Cork;
- Gortyrahilly, Co. Cork;
- Inchamore, Co. Cork
- Lissinagroagh, Co. Leitrim.

Similar to the sites which emerged in 2014; the sites which emerged in 2017 are projects in their own right which will be subject to EIA. Ballinagree, Croaghaun and Gortyrahilly planning applications have been submitted.

As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts has been, or will be, provided in the EIAR accompanying the applications for same.

The alternative to this would be to bring forward a site that did not pass the above phases of the screening process. In that instance, there would be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated or sensitive areas and visually sensitive (scenic) or amenity areas. There would also be the potential for greater shadow flicker, noise and traffic impacts if the candidate site was located in an area with a higher number of residential dwellings. In addition, a site with an average wind speed less than 7 m/s (at 80 m above ground level) and/or not located within practical proximity of existing grid infrastructure and may not be economically viable.

As stated above, Coillte conducted two reviews of its land in recent years in which it examined candidate sites for wind energy development. However, as also stated above Coillte (now FEI) continuously assesses its lands for wind opportunities and other sites can emerge periodically.

3.5.2 Suitability of the Candidate Site

It is critical for the Developer and their project team to ensure that the most suitable site for development of a proposed wind farm is identified and progressed through planning due to the financial commitments involved i.e., the cost of building each megawatt (MW) of electricity-generating capacity in a wind farm is in the region of €1.8 million to €2.0 million.

The site suitability has been fully informed by national, regional and local policy constraints and the location accords with these policies and objectives. (See Planning Statement accompanying this application.)

The site was further examined in the context of the following elements which are considered decisive in determining viability for a wind farm project:

- National Grid Connection Capacity;
- Designated sites;
- Wind Speeds, and
- Population Density.

3.5.2.1 National Grid Connection

Potential grid connectivity and constraints were also considered during the strategic site selection process as detailed in the strategic screening exercise. The Inchamore Site was found to be in proximity to two nodes on the national transmission system, notably Ballyvouskill 220 kV GIS substation and Cloonkeen 110 kV substation. These were assessed at a high level for connection and capacity. Ballyvouskill was selected because it

had capacity available, as opposed to the very limited capacity at Clonkeen and is closer to the Site (i.e. within 13 km as the crow flies).

The assessment of the grid route options is described in detail in **Section 3.6.4.3**.

3.5.2.2 Designated Sites

It is preferable that wind energy development is not located in an area designated as a Natura 2000 site. The Project is not located within any area designated for ecological protection. The nearest Natura 2000 site, i.e., Special Area of Conservation (SAC) or Special Protection Area (SPA) to the Project is Killarney National Park, Macgillycuddy's reeks & Caragh River Catchment SAC. The closest distance between the cable route corridor and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is 41 m. Killarney National Park, Macgillycuddy's reeks & Caragh River Catchment SAC is the closest Natura 2000 site to the Site, situated 3 km north of the Site at the nearest point. The nearest national designated site, i.e. Natural Heritage Area (NHA) to the Project is Sillahertane Bog NHA, which is located approximately 5.5 km to the south-west of the Site. Please note that there is no connectivity between Silahertane Bog NHA and the Project. The nearest proposed Natural Heritage Area (pNHA) to the Project is Killarney National Park, Macgillycuddy's reeks & Caragh River Catchment pNHA which is located 41 m from the grid route corridor at the closest point.

3.5.2.3 Wind Speeds

Wind speed was assessed at the Site in order to determine if wind energy development would be feasible. Wind speed analysis through the Irish Wind Atlas produced by Sustainable Energy Authority of Ireland (SEAI) was used to determine average wind speeds for the country. With the upland nature of the landscape, the Wind Atlas shows that wind speeds on the Site are consistent with a wind farm development (7.5 m/s at 30 m, 8.3 m/s at 75 m, 8.5 m/s at 100 m and 9.10 m/s at 150 m).

3.5.2.4 Population Density

Areas with low housing density are preferable for wind energy development so as to minimise potential disturbance to residential amenity. Having reviewed the settlement patterns in the vicinity of the Site, the study area has emerged as suitable to accommodate the proposal. The population density of the local Study Area (i.e. Study Area 1 as described in the **Chapter 4: Population and Human Health**) is 18.4 persons per square kilometre[3]. This is significantly lower than the average rural population density of 27 persons per square

[3] https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/ [Accessed, 22/06/2022]

kilometre in rural areas[4]. The low population density of the Site provides greater capacity for wind energy development, allowing for a greater number of turbines to be constructed while maintaining appropriate setback distances from dwellings as set out in the Wind Energy Development Guidelines.

3.5.2.5 Summary

From the review of the criteria set out above, the Site was identified as a suitable candidate site for the provision of a wind farm of the scale proposed. The Site is located predominantly within agricultural land and existing commercial forestry which allows the Site to take advantage of existing access roads (which will be upgraded in specific locations). This combined with the proximity to the existing Ballyvouskill substation further highlights the suitability of the Site as it can make further sustainable use of these established items of infrastructure. The Site is also designated as 'Open to Consideration' within the Cork County Development Plan 2022 - 2028, does not overlap with any designated sites and is located in an area with a relatively low population density with appropriate annual wind speeds.

3.6 WIND FARM DESIGN AND LAYOUT

The design of the Development has been informed by the designers, Developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists, telecommunication specialists, and traffic consultants. The aim is to reduce potential for environmental effects while designing a project capable of being constructed and viable and maximising wind resource. Throughout the preparation of the EIAR, the layout of the Development has been revised and refined to take account of the findings of all site investigations, which have brought the design from its first initial layout to the current proposed layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities and as detailed in **Section 1.10** of **Chapter 1: Introduction**.

3.6.1 Constraints Led Approach

The design and layout of the Development follows the recommendations and industry guidelines set out in the 'Wind Energy Development Guidelines' (Department of the Environment, Heritage and Local Government, 2006), 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012) and the Draft Revised Wind Energy Development Guidelines, December 2019. The layout and design were an iterative process which followed the constraints-led design approach.

[4] https://www.cso.ie/en/releasesandpublications/ep/p-cp2tc/cp2pdm/pd/ [Accessed 22/06/2022]

The constraints-led design approach consists of the identification of environmental sensitivities within the Site by the design team with a view to identifying suitable areas in which wind turbines may be located. The resulting area is known as the 'Developable Area'.

The constraints identification process included the gathering of information through detailed desk-based assessments, field surveys and consultation. Sensitive receptors were mapped and the design constraints were applied. Setback buffers were placed around different types of constraints to clearly identify the areas within which no development works will take place. The size of the buffer zone for each constraint has been assigned using guidance presented in the Department of the Environment, Heritage and Local Government Wind Energy Guidelines (DoEHLG, 2006) and other relevant Best Practice standards, which are identified in each chapter of this EIAR. The proposed setbacks also comply with the Draft Wind Energy Guidelines 2019 requirements.

The constraints map for the Site, as shown in **Figure 3.1** encompasses the following constraints and associated buffers:

- 4 x tip height separation distance from residential properties in line with the new draft guidelines)
- Operator specific buffer from existing Telecommunication Links
- 65 m buffer of Watercourses
- 100 m buffer from Archaeological Sites or Monuments
- Available lands for development
- Separation distance (oversail) from landowners not involved in the Project (77.5 m)
- Distance from designated sites
- Good wind resource
- Existing access points and general accessibility of all areas of the Site due to existing road infrastructure
- Avoidance of environmental constraints identified from desk studies

The inclusion of the constraints on a map of the study area allowed for a viable developable area to be identified. The process included the identification of a developable area in the west of the site. However, this was not considered for development due to the size (could accommodate a single turbine) and the separation distance from the other turbines would have a negative visual impact.

The wind farm design process looked at all land that was available for development within and immediately surrounding the preliminary red-line boundary (**Figure 3.2a** and **3.2b**). The

constraints, as discussed in **Section 3.6.1** and shown on **Figure 3.1**, associated with these lands were assessed. Some lands were discounted due to the telecommunication links running to the north and south of the site, the presence of habitats including Mosaic of Upland Blanket Bog and Wet Heath and residential receptors.

The first turbine layout (**Figures 3.3**) was then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required between the turbines.

Following the mapping of all known constraints, detailed site investigations were carried out by the project team. The ecological assessments of the Site encompassed habitat mapping and extensive surveying of birds and other fauna. These assessments, as described in **Chapter 5: Aquatic Ecology**, **Chapter 6: Terrestrial Ecology** and **Chapter 7: Ornithology**, optimised the decision on the siting of turbines as explained in Section 3.6.2.

Similarly, the hydrological and geotechnical investigations of the Site informed the proposed locations for turbines, roads and other components of the Development, such as the substation and the construction compound. This included peat depth and peat stability analysis (**Chapter 8: Soils and Geology**) and the identification of watercourses, groundwater constraints, flood risk and wells (**Chapter 9: Hydrology and Hydrogeology**). Where specific areas were deemed as being unsuitable (e.g., unstable peat giving high risk for slippage) for the siting of turbines or roads, etc., alternative locations were proposed and assessed, taking into account the areas that were already ruled out of consideration. The turbine layout for the proposed wind farm has also been informed by wind data which has been collected from an on-site meteorological mast and the results of noise assessments as they became available.

3.6.2 Turbine Layout

The final proposed turbine layout of the Development shown in **Figure 3.6** takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on the results of all site investigations and feedback from consultations that have been carried out during the EIAR process.

The final selection of turbine number and layout has had regard to wind-take by siting the turbines to achieve optimal performance (three times the rotor diameter (3d) in the crosswind direction and seven times the rotor diameter (7d) in the prevailing downwind direction). Potential noise emissions considerations were also incorporated into turbine

layout by ensuring no turbines are constructed in a location that would lead to unacceptable noise impacts on nearby receptors. Potential shadow flicker impacts were also considered by maintaining a 4 x tip height buffer from sensitive receptors and selecting suitable candidate turbines with built in shadow shut down measures where the turbine operating control system detects when sunlight is strong enough to cast a shadow on a property or properties, and automatically shuts down for a period until the conditions resulting in the shadow impact have passed.

The EIAR and wind farm design process was an iterative process. As information regarding the Site was compiled and assessed, the number of turbines and the proposed layouts was revised and amended to take account of the physical constraints of the Site. The requirement for buffer zones and other areas in which no turbines could be located was also compiled and assessed. Findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

The Development of the final proposed wind farm layout has resulted following feedback from the various studies and assessments carried out as well as ongoing negotiations and discussions with landowners and the local community. The specific locations of the various turbines were reviewed during the optimisation of the Site layout. This was achieved by strictly adhering to the Developable Area for the location of the turbines and avoiding known constraints for the site infrastructure.

Preliminary Layouts

In 2018 and 2019, the Developer looked at layouts with 15 No. smaller turbines and 5 No. larger turbines at the selected Site respectively as shown in **Figure 3.2a** and **3.2b**. In 2018 a landscape and visual impact assessment was undertaken for the 15 turbine layout. It found the main issue with the layout was the sprawling lateral extent of the development, which was generally concentrated on one hillside/ridge, but extended across a shallow valley to the west to form another cluster which in-turn linked to an existing / permitted wind energy development on a skyline ridge to the west. Consequently, the western half of the scheme contributed disproportionality to a negative visual impact including negative cumulative impacts, which were considered to be a particular issue for the 15 turbine layout. The study therefore recommended to reduce the overall extent and scale of the proposed development to reduce localised impacts and also to maximise the buffer to the nearest large cluster of Kilgarvan wind farms. Following the 2018 assessment a new layout was designed in 2019 which reduced the turbine number to five significantly reducing the negative visual impact.

At the preliminary design stage in 2018 and 2019 the constraints-led approach was limited and did not include all the constraints listed in Section 3.6.1.

First Layout

In 2020 a constraints study was undertaken for the Site using all criteria outlined in 3.6.1. The redline boundary was reduced from that used in the preliminary design as a number of private landholders did not want to proceed with long-term lease agreements. The study identified a viable area within the overall study area suitable for five turbines. In line with the 2006 Wind Energy Guidelines a separation distance between the turbines of three times the rotor diameter (3d) in the crosswind direction and seven times the rotor diameter (7d) in the prevailing downwind direction was applied to ensure optimal performance.

The first layout in shown in **Figure 3.3.**

Second Layout

Following the design of the first layout and a review of the viable lands the number of turbines was increased from 5 No. to 6 No. as a result of additional technical information provided by the wind turbine supplier which allowed the separation distance between the turbines to be reduced from 7d to 5d.

The second layout is shown in **Figure 3.4.**

Third Layout

The third layout as presented in **Figure 3.5** takes account of all site constraints arising from the site investigation results collated during the EIAR (e.g., ecology, ornithology, hydrology, peat depths etc.) and design constraints (e.g., setback distances from houses and third-party lands/infrastructure and distances between turbines on-site etc.). As stated above this layout also takes account of the results of all detailed site investigations and baseline assessments that have been carried out during the EIAR process.

The turbine locations from the third layout remained the same as the second layout. However, the crane hardstand for T3 was adjusted as it was located in a potential landslide susceptibility area. The access road from T3 to T1 and T3 to T2 were also realigned to avoid high risk landslide susceptibility areas. The red-line boundary was reduced to encompass only the area of the Site that was now confirmed as viable for development see **Figure 3.1.** The area within the red-line boundary reduced from 481 ha to 170.1 ha.

Fourth and Final Layout

Following further conversations with the owner of H5, a derelict, unoccupied property which is shown in **Figure 1.3** as located within the 4 x tip height housing buffer, it was decided to remove a turbine, T6 (**Figure 3.5**). The final five turbine layout is show in **Figure 3.6.**

A comparison of the potential environmental effects of the three wind turbine layouts when compared against the final layout are presented in **Table 3.2**.

Table 3.2: Environmental effects from first and second layout iteration compared to the final layout

Criteria	First Layout (5 wind turbines)	Second Layout (6 wind turbines)	Third and Final Layout (6 wind turbines with realigned roads and hard standing for T3)	Fourth and Final Layout (5 wind Turbines)
Population & Human Health (incl. Shadow Flicker)	No material environmental difference for population or human health.	No material environmental difference for population or human health.	No material environmental difference for population or human health.	No material environmental difference for population or human health.
Biodiversity	No significant environmental impacts.	No significant environmental impacts.	No significant environmental impacts.	No significant environmental impacts.
Ornithology	No significant environmental constraints	No significant environmental constraints	No significant environmental constraints	No significant environmental constraints
Soils & Geology	Slight decrease in the volume of peat and spoil to be managed. Overall no significant environmental impacts.	Slight increase in the volume of peat and spoil to be managed. Overall no significant impacts.	This layout was amended following geotechnical investigations to avoid areas of peat slide susceptibility areas. Overall no significant environmental impacts	Slight decrease in the volume of peat and spoil to be managed. Overall no significant environmental impacts.
Hydrology & Hydrogeology	No significant environmental impacts.	An increase in the volume of peat and spoil to be managed on site would increase the potential for runoff. Overall no significant environmental impacts.	The hydrology and hydrogeology impacts remain the same as the second layout. Overall no significant environmental impacts.	No significant environmental impacts.

Criteria	First Layout (5 wind turbines)	Second Layout (6 wind turbines)	Third and Final Layout (6 wind turbines with realigned roads and hard standing for T3)	Fourth and Final Layout (5 wind Turbines)
Air & Climate	Slight increase in the carbon payback time. Overall a long-term, significant, positive impact on Climate.	Slight decrease in the carbon payback time. Overall a long-term, significant, positive impact on Climate.	The carbon payback time remains the same as the second layout. A long-term, significant, positive impact on Climate.	Slight increase in the carbon payback time. Overall a long-term, significant, positive impact on Climate.
Noise	No significant noise impacts	No significant noise impacts	No significant noise impacts	No significant noise impacts
Material Assets	Slight decrease in the area of forestry removal required. No significant impact on material assets.	Slight increase in forestry removal required. No significant impact on material assets.	The area of forestry is the same as the second layout. No significant impact on material assets.	Slight decrease in the area of forestry removal required. No significant impact on material assets.
Landscape & Visual	Slightly less visual impact. No significant landscape and visual impacts.	The visual impact is slightly increased with the additional turbine. However, overall there are no significant landscape and visual impacts.	The landscape and visual impacts are the same as the second layout. Overall no significant landscape and visual impacts.	Slightly less visual impact. No significant landscape and visual impacts.
Cultural Heritage	No significant cultural heritage impacts.	No significant cultural heritage impacts.	No significant cultural heritage impacts.	No significant cultural heritage impacts
Traffic and Transport	A smaller development footprint would require less construction traffic and the volume of construction traffic using public roads would be less. Overall no significant impact to traffic and transport.	Larger development footprint would lead to an increase in construction traffic using the public roads.	The volume of construction traffic would be the same as the second layout. Overall no significant impact to traffic and transport.	A smaller development footprint would require less construction traffic and the volume of construction traffic using public roads would be less. Overall no significant impact to traffic and transport.

3.6.3 Internal Site Access Road Layout

Roads must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. It was deemed necessary during the initial design of the Development that existing roads would be utilised where possible to minimise the potential for impacts by constructing new roads as an alternative.

As the overall site layout was finalised, the most suitable routes between each component of the Development were identified, taking into account the existing roads and the physical constraints of the Site. Locations were identified where upgrading of the existing road would be required. This included where sections of new roads would need to be constructed, in order to ensure suitable access to and linkages between the various project elements, and efficient movement around the Site.

An alternative option to utilising the existing road network within the Site would be to construct a new road network, having no regard to existing roads. This approach was considered unfavourable, as it would require unnecessary disturbance to the Site and create the potential for additional environmental impacts to occur. It would also result in an unnecessary requirement for additional cut and fill material to be used in the construction of these new roads. A comparison of the potential environmental effects of constructing an entirely new road network when compared with maximising the use of the existing road network is presented in **Table 3.3**.

Table 3.3: Comparison of environmental effects from constructing a new Internal Site Access Road network verses utilising existing Site Access Roads and supplementing with new Site Access Roads where required

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Larger development footprint results in additional dust and noise generated during construction.
Biodiversity	Larger development footprint will result in greater habitat loss.
Ornithology	Larger development footprint will result in greater habitat loss which could impact birds.
Soils & Geology	Larger development footprint will result in greater volumes of peat and spoil to be excavated and stored. Larger volume of stone required from on-site borrow pit for road construction.
Hydrology & Hydrogeology	Larger development footprint and increased number of new watercourse crossings, therefore, increasing the

Criteria	Comment
	potential for silty runoff to enter receiving watercourses.
Air & Climate	Potential for greater dust emissions due to the requirement of an increased volume of stone from the on-site borrow pit. Potential for greater vehicular emissions due to increased volume of construction traffic. However, these will not be significant.
Noise	Larger development footprint results in additional nose generated during construction.
Material Assets	Larger development footprint will result in greater land-take and a greater change in land use.
Landscape & Visual	Potential for visual and landscape impacts due to the construction of new roads. However, this will not be significant.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic and Transport	Larger development footprint will increase the volume of construction traffic impacting the public road network. However, these will not be significant.

3.6.4 Location of Ancillary Structures

The alternatives considered are discussed for the following ancillary infrastructure required for the Development: a temporary construction compound (a single compound versus two smaller compounds) electricity substation (location) and borrow pit (using local quarries versus an onsite borrow pit).

3.6.4.1 Construction Compound

The use of a single temporary construction compound as opposed to two smaller compounds located in different areas of the Site is proposed and will result in less disturbances to the Site and a reduced visual impact during construction. A comparison of the potential environmental effects of constructing a single, large construction compound when compared against constructing two smaller compounds is presented in **Table 3.4.**

Table 3.4: Comparison of environmental effects from constructing two smaller construction compounds compared to one large construction compound

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential for increased noise impacts on nearby sensitive receptors.
Biodiversity	Potential for a greater impact to the Site ecology by constructing two construction compounds in different areas of the Site as the footprint of two smaller construction compounds is larger than one large compound.
Ornithology	Potential for a greater impact to the Site ornithology by constructing two construction compounds in different areas of the Site.
Soils & Geology	Larger development footprint will result in greater volumes of peat and spoil to be excavated and stored. Larger volume of stone required from on-site borrow pit for road construction.
Hydrology & Hydrogeology	The use of multiple construction compounds sites has the potential to increase the risk of erosion and increase risk to watercourses.
Air & Climate	Potential for greater dust emissions due to the requirement of an increased volume of stone from the on-site borrow pit. Potential for greater vehicular emissions due to increased volume of construction traffic. However, these will not be significant.
Noise	Potential for increased noise impacts on nearby sensitive receptors.
Material Assets	Larger development footprint will result in greater land-take and a greater change in land use.
Landscape & Visual	Potential for visual and landscape impacts due to the construction of two construction compounds in different parts of the Site. However, this will not be significant
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic and Transport	More efficient movement and management of material across the Site.

3.6.4.2 *Onsite Substation incorporating Control Building*

The north and south of the Site were assessed for locating the Onsite Substation. Having regard to the Site constraints, the grid connection to Ballyvouskill and the EirGrid requirement to maintain 3.5 times the turbine fall over distance, the location of the Onsite Substation including Control Building the south of the Site was selected as the location of the Onsite Substation.

Table 3.5: Comparison of environmental effects from constructing an onsite substation in the South to one in the North of the Site

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential for increased noise impacts on nearby sensitive receptors at both locations.
Biodiversity	Potential for increased noise impacts on nearby sensitive receptors at both locations.
Ornithology	No potential for impacts to ornithology at either location.
Soils & Geology	The volume of spoil removed for both sites will be the same.
Hydrology & Hydrogeology	The potential for silt or sediment laden run-off to impact surface water bodies and the aquatic ecology they support the same for both sites.
Air & Climate	The potential dust emissions and exhaust emissions the same for both locations.
Noise	The potential for noise impacts will be the same for both locations.
Material Assets	The land-take will be the same for both locations.
Landscape & Visual	The visual impact of the onsite substation will be the same or both locations.
Cultural Heritage	The potential for impacts on unrecorded, subsurface archaeology is the same for both locations.
Traffic and Transport	The volume of traffic associated with the construction of the onsite substation will be the same for both locations.

3.6.4.3 *Borrow Pit*

Fill material required for the construction of access roads and turbine bases will be obtained from one onsite borrow pit and will be located to the east of T5. The use of the borrow pit represents an efficient use of existing onsite resources and eliminates the need to source

material from outside the site and transport large volumes of construction materials along the local public road network to the Site. The location for the borrow pit was identified following detailed geotechnical site investigations and site-specific constraints outlined in **Section 3.8.1,** namely 65 m buffer of watercourses, 100 m buffer from archaeological sites or monuments and the avoidance of environmental constraints identified from desk studies. The borrow pit will provide up to 50,276 m^3 of site won general fill. The proposed borrow pit shall also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

An alternative to using onsite borrow pits was the option of sourcing all stone and hardcore materials from locally licensed quarries. The transport of such material to Site would result in a significant increase in construction traffic and heavy loads and was therefore considered the least preferable option.

A comparison of the potential environmental effects of using an onsite borrow pit in comparison to using an offsite quarry is presented in **Table 3.6**.

Table 3.6: Environmental effects from utilising local quarries compared to the on-site borrow pit

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential for increased noise, vehicular and dust emissions from transporting material from offsite quarry locations to the site which could have adverse health effects. Increased HGV disturbance will lead to increased environmental nuisance.
Terrestrial Ecology	Neutral – potential for a small area of vegetation to be removed to access the borrow pit and the quarry. No significant impacts to terrestrial ecology.
Aquatic Ecology	Neutral – potential for silt or sediment laden run-off to impact surface water bodies and the aquatic ecology they support from the borrow pit and the quarry.
Ornithology	Neutral – no potential impact to ornithology.
Soils & Geology	Effect on local quarry resource.
Hydrology & Hydrogeology	Neutral – potential for silt or sediment laden run-off to impact surface water bodies and the aquatic ecology they support from the borrow pit and the quarry.
Air & Climate	Potential increase in dust emissions and vehicle emissions associated with off-site vehicle movements.

Criteria	Comment
Noise	Whilst there would be less noise generated from the Site as a result of using an offsite source, there will be an increase in noise emissions from the transport of material from offsite quarry locations on public roads. This will impact on dwellings and facilities situated along these roads.
Material Assets	Effect on local quarry resource.
Landscape & Visual	Neutral - no potential landscape and visual impact.
Cultural Heritage	Neutral - The potential for impacts on unrecorded, subsurface archaeology is the same for both locations.
Traffic and Transport	Additional HGV trips required for importation of fill.

3.7 ALTERNATIVE DESIGN PHILOSOPHY AND SPECIFICATIONS

Consideration was given to an appropriate limited range of turbine dimensions that would allow suitable flexibility at procurement stage. This is necessary because of the rate of change in technology and the length of time required to progress a project from early planning stage to turbine purchase. Different models that are currently available may not be available in a number of years and models that are not available now are likely to become available. The Developer undertook a review of currently available technology and chose a range of dimensions that ensures the best chance of a competitive procurement process for the proposed limited range of dimensions.

The result was the proposed limited range of dimensions as set out below:

- A tip height range of 177 m to 185 m;
- A hub height range of 102.5 m to 110.5 m, and
- A rotor diameter range of 149 m to 155 m.

The range of dimensions are shown on **Figure 1.4**.

3.7.1 Turbine Type

This output may vary as a result of the final turbine type, power output modelling and turbine development over the period leading up to construction. For the purposes of this EIAR, a minimum rated output of 5.6 MW and a maximum rated output of 6.6 MW has been used to calculate the power output of the proposed wind farm, which will result in an estimated installed capacity of between 28 MW to 33 MW. A wind farm with the same potential power

output could also be achieved on the Site by using smaller turbines (for example 3.5 MW machines). However, this would necessitate the installation of up to 11 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the wind resource available having regard to the nature of the Site. Taller wind turbines with larger rotor diameters allow wind turbines to sweep more area, capture more wind, and produce more electricity.

3.7.2 Number of Turbines

A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the Site, with a larger amount of supporting infrastructure being required (i.e., roads etc) and increasing the potential for environmental impacts to occur.

The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the Site. The 5 No. turbine layout selected for the Site has the smallest development footprint, while still achieving the optimum output.

3.7.3 Height of Turbines

The turbine model to be installed on the Site will be the subject of a competitive tendering process and will be within the following dimensions. The height of the turbines that will be selected for construction on the Site will have an overall ground to blade tip height ranging from 177 m to 185 m, a rotor diameter ranging from 149 m to 155 m and a hub height ranging from 102.5 m to 110.5 m. The use of alternative smaller turbines at this Site would fail to make the most efficient use of the wind resource passing over the Site.

Following the establishment of the developable area of the Site, as part the design alternative process, specific turbine models with different heights (177 m, 180 m and 185 m) were considered before settling on the tip height range of 177 m to 185 m now proposed.

The relationship between the turbine height and density (number of turbines) required to achieve a particular output was a key design consideration. From research carried out by Betakova *et al.* (2015) people have highlighted that when given an option, they tend to prefer a scenario of fewer larger turbines:

"People prefer reducing the number of turbines by replacing smaller turbines with larger ones even though larger ones might be visible from a larger number of residences"

One such study commissioned by Fáilte Ireland in 2008 found that:

"In terms of the size and composition of wind farms, tourists tended to prefer farms containing fewer turbines. If both produced the same amount of electricity, tourists also preferred wind farms containing a small group of large turbines (55%) to a large group of smaller turbines (18%)."[5]

On the basis of these factors and through design stage analysis, consideration was given to the approach that the slightly increased sense of visual dominance imparted by taller turbines is preferable to the reduced level of permeability and increased visual array 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.

The consideration to provide fewer, larger turbines with greater power output is in line with industry trends. This option increases energy efficiency, improving the energy output to the national grid per turbine, thus reducing the cost of energy for the consumer. The use of less turbines also reduces the impact on the receiving environment with less land-take required to accommodate the wind farm, with less associated construction works as detailed above. Recent permitted wind farm applications in Ireland tend towards larger/taller turbines (i.e., the larger turbine tip heights that are available on the market in Ireland). Examples of recent consented wind farms which include larger/taller turbines are the Carrownagowan Wind Farm, Co. Clare (ABP ref. PA03.308799) which consists of 19 No. wind turbines at 169 m tip height, Castlebanny Wind Farm, Co. Kilkenny (ABP ref PA10.309306) which consist of 21 No. wind turbines at 185 m tip height, Ardderroo Wind Farm, Co. Galway (ABP ref. PL07 .303086) which consists of 25 No. wind turbines at 178.5 m tip height. Coole Wind Farm, Co. Westmeath (ABP ref. PL25M.300686) which consists of 13 No. wind turbines of 175 m tip height, and Derrinlough Wind Farm (ABP ref. PA19.306706) which consists of 21 No. wind turbines of 185 m tip height.

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing a smaller number of larger wind turbines are presented in **Table 3.7**.

[5] https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf [Accessed 25/10/2022]

Table 3.7: Environmental effects from a large number of smaller wind turbines compared to the Development

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impact on nearby sensitive receptors.
Biodiversity	Larger development footprint would result in greater habitat loss.
Ornithology	The presence of more turbines would increase the potential effects on birds.
Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated.
Hydrology & Hydrogeology	The larger development footprint would increase the potential for silty runoff to enter receiving watercourses.
Air & Climate	Neutral – Potential air and climate impacts would be similar.
Noise	Potential for increased noise impacts on nearby sensitive receptors.
Material Assets	Neutral – Potential material assets impacts would be similar.
Landscape & Visual	A larger number of smaller turbines would have a greater visual impact.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.

3.8 ALTERNATIVE GRID CONNECTION

3.8.1 Grid Connection Technology and Routes

A key consideration in determining the Grid Connection technology for a proposed wind energy development is whether the cabling is undergrounded or run as an overhead line. While overhead lines are less expensive and allow for easier repairs when required, underground lines will have no visual impact. A comparison of the potential environmental effects of constructing overhead lines when compared against constructing underground lines is presented in **Table 3.8**.

Table 3.8: Environmental effects from overhead lines compared to underground lines

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential to impact property prices due to visual impact.
Biodiversity	Where underground lines are unable to be placed in the road there is greater potential for impact to biodiversity as the footprint of cable trenches will be greater than that of wooden poles.
Ornithology	Neutral – No potential impact to ornithology.
Soils & Geology	Cable trenches have a larger footprint than OHL pole and will have a greater potential to impact soils and geology as the excavation volumes will be greater.
Hydrology & Hydrogeology	There is greater potential for water impacts due to sediment release for cable trenches as there will be a greater volume of material excavation than with OHL poles.
Air & Climate	Slightly less dust emissions associated with OHL installation due to the smaller excavation footprint.
Noise	Potential for noise impacts similar for OHL and cable trench installation during the construction and decommissioning phases. Potential for greater operational noise from OHL.
Material Assets	Neutral – Potential impacts to material assets similar for OHL and cable trench installation.
Landscape & Visual	Potential for greater visual impact due to overground poles and cables.
Cultural Heritage	Potential for impacts on unrecorded, subsurface archaeology is greater for underground lines as they will be placed on land/off-road and will cover a greater surface area than OHL poles.
Traffic and Transport	Potential for a slight impact to traffic using the forest track running from the Site entrance to the N22 during the cable trench installation, however the majority of the proposed grid connection route is offroad. No traffic impacts associated with OHL as it would be all offroad.

3.8.2 Grid Connection Routes

Potential grid connectivity and constraints were also considered during the strategic site selection process as detailed in the strategic screening exercise as discussed in **Section 3.5.2.1.** Ballyvouskill 220 kV GIS substation was selected because it had capacity available

when compared to Clonkeen and because of its closer proximity to the Site (i.e., within 13 km as the crow flies).

Four underground cabling route options from Inchamore to Ballyvouskill were initially considered and assessed as part of a civil and structural due diligence to determine which route would be brought forward. . The four routes, Route A, B, C and D are shown on **Figure 3.7**. Route D has three route options for connection to Ballyvouskill. The initial grid route assessment found a combination of Route B and C combined with Route D Option 2 or Option 3 was the most favourable as the majority of the route is within Coillte lands and there are less bridge crossings.

On review, a combination of Route B (excluding the section running towards the Sullane), Route C and Route D Option 3 was chosen as the grid route. This route was selected as it avoided utilising the alternative Route A. The risks associated with the constructability of Route A were the Macroom to Millstreet bypass, crossing a protected bridge, and existing services in the road. The selected grid route has less bridges and the majority of it is located within Coillte lands, reducing the requirement to access further third party owned property. A comparison of the potential environmental effects of constructing Route A compared against the chosen option (combined Routes B, C and D) is presented in **Table 3.9**.

Table 3.9: Environmental effects of grid Route A compared against the chosen option (combined Routes B, C and D)

Criteria	Route A	Route Option (combined options B, C, D,)
Population & Human Health (incl. Shadow Flicker)	Neutral as the temporary works will avoid Ballyvourney.	Neutral as the temporary works will avoid Ballyvourney.
Terrestrial Ecology	Route A travels along public roads within St Gobnets Wood SAC and Mullaghanish to Musheramore Mountains SPA with some off-road sections proposed where lands are hydrologically connected to St Gobnets Wood SAC and Mullaghanish to Musheramore Mountains SPA.	The chosen route (combined options B, C and D travels through an area which is hydrologically connected to Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment, is ecologically connected to Mullaghanish to Musheramore Mountains SPA and there is a potential ecological connection to Killarney National Park SPA.
Aquatic Ecology	Route A drains to Sullane and Foherish catchments with 14	Route B and C drains to the River Flesk (which is hydrologically

Criteria	Route A	Route Option (combined options B, C, D,)
	stream crossings along the route. Annex II Freshwater Pearl Mussel (*Margaritifera margaritifera*) and Atlantic Salmon (*Salmo salar*) are present within both river systems.	connected To Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment SAC), and Foherish River. Route D drains to the Garrane stream, a tributary of the Foherish River. Route B drains to the Sullane River. There are Annex II Freshwater Pearl Mussel ((*Margaritifera margaritifera*) and Atlantic Salmon (*Salmo salar*) present within the above mentioned river systems.
Ornithology	Route A runs through St. Gobnet's Wood SPA and Mullaghanish to Musheramore Mountains SPA.	Route D is ecologically connected to Mullaghanish to Musheramore Mountains SPA and is potentially connected to Killarney National Park SPA.
Soils & Geology	Route A is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also observed.	The Grid Connection Route is approximately 19.9 km of which 1.3 km is within the Site. The remaining 18.6 km is located off-road and in third-party lands. The potential impacts associated with the Grid Connection Route in relation to soils and geology in general are considered slight.
Hydrology & Hydrogeology	Route A has five bridge crossings which would increase the potential for silty runoff and hydrocarbons to enter receiving watercourses.	There are three bridge crossings and therefore less potential for silty runoff and hydrocarbons to enter receiving watercourses.
Air & Climate	Temporary dust and exhaust emissions from construction vehicles	Temporary dust and exhaust emissions from construction vehicles
Noise	Temporary noise impacts during the construction phase.	Temporary noise impacts during the construction phase.
Material Assets	Neutral – No impact to material assets.	Neutral - No impact to material assets.
Landscape & Visual	Neutral – No visual impact.	Neutral – No visual impact.

Criteria	Route A	Route Option (combined options B, C, D,)
Cultural Heritage	Neutral – route located in existing roads and tracks.	Neutral – route located in existing roads and tracks.
Traffic and Transport	Neutral as some temporary road closures will be necessary of narrow roads to facilitate the installation of cables.	Neutral as some temporary road closures will be necessary on narrow roads to facilitate the installation of cables.

3.9 ALTERNATIVE RENEWABLE ENERGY TECHNOLOGIES

Forestry and agriculture will continue to be carried out on the Site around the footprint of Development. An alternative source of renewable energy considered for Site following its identification was solar energy. Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic arrays (panels). The capacity factor of solar energy is significantly lower than that of onshore wind energy, requiring approximately three times the capacity of the Development (i.e. X (3) x Y (33 MW) = Z (99 MW)) to produce the same amount of energy. Solar farms require 1 hectare per MW, the land area required to generate the equivalent amount of MW would be in the region of 40 ha. This compares to a footprint of 14.86 ha for the five proposed turbines. **Table 3.10** outlines the potential impact from the development of a solar photovoltaic array when compared to a wind farm energy development. The selected wind farm energy development is the most efficient method of energy production with the lesser potential for significant, adverse environmental effects.

Table 3.10: Environmental effects from a solar photovoltaic array compared to a wind farm development

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local road users and at dwellings.
Biodiversity	Larger development footprint would result in greater habitat loss.
Ornithology	Potential for mimicry of sensory cues i.e., glint and glare similar to water leading to bird fatalities caused by collision. This can be mitigated.
Soils & Geology	Although Solar PV has a larger development footprint the volume of peat and spoil to be excavated is less

Criteria	Comment
	than that required for a wind farm due to the shallow excavation works required during construction.
Hydrology & Hydrogeology	A solar PV array development would require a larger development footprint therefore increasing the potential for silty laden runoff to enter receiving watercourses.
Air & Climate	Reduced capacity factor of solar PV array technology would result in a longer carbon payback period.
Noise	The potential noise impacts from a solar PV are less than that of a wind energy development due to the smaller scale construction and there is no noise associated with the solar panels.
Material Assets	The larger development footprint would have a greater impact on the land use (Forestry and Agriculture) of the Site.
Landscape & Visual	Potentially less visible from surrounding area due to screening from existing forestry and topography. More of a local low level visual impact due to the increased land take and slope of the land.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic & Transport	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output. However, due to the smaller size of the solar panels there may be less work required along the TDR route to accommodate their delivery.

3.10 ALTERNATIVE TURBINE HAUL ROUTE

Alternative ports of entry and transport routes to the Site were considered, the latter in relation to turbine component delivery as well as general construction-related traffic.

3.10.1 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the Development include Ringaskiddy Port, Co. Cork and the Foynes Port, Co. Limerick. Both Ports offer a roll-on-roll-off procedure to facilitate import of wind turbines. Ringaskiddy Port was selected as the port of entry for this Project because it is located closer to the Site and a number of the existing wind farms in the locality have successfully utilised this port. This reduces the work required on the Turbine Delivery Route.

3.10.2 Turbine Component Delivery to Site

Turbine component delivery routes from Ringaskiddy Port included the N40 and the N22. This route has proven suitable for the transport of turbine components for other wind farm developments in the area. The transport analysis (as presented in **Chapter 15: Traffic and Transportation**) shows that only minor additional accommodation works will be required to accommodate the proposed turbines.

3.10.2.1 Civil Construction Haul Route

The local road network in the vicinity of the Site and the supplier locations were assessed for the Civil Construction Haul Route. A number of the local roads were not suitable as they were too narrow or they would have required upgrade works.

The proposed Civil Construction Haul Routes are shown on **Figure 15.3**.

Specific grades of rock fill will be required as fill under turbine foundations while sub-base and base course materials for the access track and turbine hardstand construction will be sourced on site from borrow pits. Concrete, crushed stone and concrete blocks for construction of the Development will come from licenced quarries in the locality such as:

- McGroup Keim Quarry;
- Coppeen Concrete, Enniskeane;
- Mid-Cork Quarries, Gortnadiha;
- McSweeney Bros, Kilmichael;
- Keohane Readymix, Ballygurteen, and
- Murray Bros Tarmacadam Ltd, Ardcahan.

These quarries will also be the source of crushed stone and road surfacing for widening works to the turbine haul route (existing Coillte track) and for grid connection works.

From Keim, trucks will follow the R582 in a southern direction and then travel in a westerly direction along the L-5226-0, the L-7418-55, the L-7418-25 and the L-7418-0 to Ballyvourney and will then follow the N22 to the site entrance.

For the quarries to the south (all bar Mc Group Keim), trucks will use the R587, then the R584 to the new Macroom By-Pass (N22) and then follow the old N22 to the site.

For the Grid Connection Route, general material excavated from trenches in public roads will be disposed of to a licenced facility while excavated road surfacing material will be

recycled. Excavated road surfacing materials will be recycled and used for temporary reinstatement of trenches. General soil waste will be transported to one or more of the following licensed facilities:

- Tomas Mullins, Scrahanagown, Coolea, Co. Cork;
- Richard & Dennis Carroll Plant Ltd., Clonfadda, Macroom, Co. Cork;
- Ciaran Ryan Plant Hire Ltd., Ballymacorcoran, Clondrohid, Co. Cork, and
- Séan Ó Luasa, Na Foithrí (Fuhirees), Cúil Aodha, Maighchromth, Co. Chorcaí.

Soil and stone spoil from road widening on the Turbine Haul Route will be disposed of to the same facilities.

Bitumen and supplementary road surfacing for trench reinstatement can be sourced from Lehane Tarmacadam, Kilbarry, Macroom, Co. Cork or McSweeney Bros, Kilmichael or Murray Bros Tarmacadam Ltd., Ardcahan and will use the routes as shown on **Figure 15.3**.

Grid construction traffic will use the grid route and link with the N22 at Cummeenavrick or will be serviced from the wind farm site.

3.11 ALTERNATIVE MITIGATION MEASURES

Mitigation by avoidance has been central to the Project's evolution. By avoiding the sensitive areas of the Site using the constraints led approach described in **Section 3.6.1** the potential for environmental effects is limited. As noted above, the site layout aims to avoid any environmentally sensitive areas through the application of site-specific constraints. Where loss of habitat occurs at the Site, this has been mitigated with the proposal of enhancement lands.

The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential environmental effects associated with this. The best practice design and mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the Site and any identified sensitive receptors.

3.12 CONCLUSION

A description of the reasonable alternatives in terms of wind farm design and layout, design philosophy and specifications, grid connection, renewable energy technologies, turbine haul route and mitigation measures, studied by the Developer, which are relevant to the proposed project and its specific characteristics (maximum 33 MW output, five turbines with

a tip height range of 177 m to 185 m, a hub height range of 102.5 m to 110.5 m and a rotor diameter range of 149 m to 155 m – large scale wind farm), and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects has been provided.

4 POPULATION AND HUMAN HEALTH

4.1 INTRODUCTION

4.1.1 Background and Objectives

This Chapter of the EIAR assesses the impacts of the Project (**Figure 1.2**) on population and human health, including the proposed grid connection and turbine delivery routes assessed as part of this EIAR. (**Chapter 2: Project Description**). Where negative effects are predicted, the chapter identifies appropriate mitigation strategies. The assessment considers the potential effects during the following phases of the Development:

- Construction of the Project;
- Operation of the Project, and
- Decommissioning of the Project.

This Chapter of the EIAR is supported by Figures in **Volume III** and the following Appendix document provided in **Volume IV**:

- **Appendix 4.1a to d: Shadow Flicker Assessment**

4.1.2 Statement of Authority

This chapter has been prepared by Jennings O'Donovan & Partners Limited. It was prepared by Mr. David Kiely and Ms. Sarah Moore, with the assistance of Ms. Shirley Bradley.

Mr. David Kiely has undertaken EISs/ EIARs for wind farms throughout Ireland. He has 39 years' experience in the civil engineering and environmental sector and has obtained a Bachelor of Engineering Degree in Civil Engineering and a Master of Science degree in Environmental Protection. David has overseen the development of over 50 wind farms from feasibility, planning and environmental assessment through to construction, including the preparation of population and human health chapters for other wind farms.

Ms. Sarah Moore is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Environmental Science from University of Limerick and a MSc (Dist.) in Environmental Engineering from Queen's University, Belfast. She has worked in environmental consultancy for over fourteen years and has prepared AA Screenings, Environmental Reports and EIARs for other wind farms including shadow flicker assessments.

Ms. Shirley Bradley is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities are in report writing, assisting Senior Consultants and GIS.

4.1.3 Relevant Legislation and Guidance

The population and human health section of this EIAR is carried out in accordance with legislation and guidance contained in **Chapter 1: Introduction** and the **Planning Statement.** Fáilte Ireland's "EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects" was also adhered to in the preparation of this chapter. The design and construction of the Project including the installation of associated equipment such as switchgear and substations is governed by the 2005 Safety, Health and Welfare at Work Act, The Safety, Health and Welfare at Work (General Application) Regulations 2021 and also by S.I. 291 The Safety, Health and Welfare at Work (Construction) Regulations, 2013 as amended.

The Revised EIA Directive Consultation (revised EIA Directive 2014/52/EU) (Section 1.2.2) states that:

"*It is intended that the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters, and not requiring a wider consideration of human health effects which do not relate to the factors identified in the Directive*".

4.1.4 Assessment Structure

In line with the EIA Directive as amended and current EPA guidelines the structure of this chapter is as follows:

- Assessment Methodology and Significance Criteria – a description of the methods used in desktop surveys and in the assessment of the significance of effects;
- Baseline Description – a description of the socio-economic profile of the local area of the Development, i.e., of local electoral areas and of County Cork and based on a desk-based study using Central Statistics Office (CSO) data;
- Assessment of Potential Effects – including the "Do Nothing" scenario and identifying the ways in which the population and human health of the area could be affected by the Development during the construction, operational and decommissioning stages;
- Mitigation Measures and Residual Effects – a description of measures recommended to avoid, prevent, reduce or, if necessary, offset any potential significant adverse effects and a summary of the significance of any residual effects of the Development after mitigation measures have been implemented;
- Cumulative Effects – identifying the potential for effects of the Development to combine with those from other existing, permitted and/or proposed projects as listed in **Chapter 2: Project Description** of this EIAR, to affect the population and human health;
- Summary of Significant Effects, and

- Statement of Significance.

With respect to the EIA Directive as amended, Section 1.2.2 (outlined in Section 4.1.3), amalgamates the findings of other assessments undertaken as part of the EIA process. Limited interactions with Human Health are possible and consideration has been given to the findings of the following assessments:

- Chapter 8: Soils and Geology
- Chapter 9: Hydrology and Hydrogeology
- Chapter 10: Air and Climate
- Chapter 11: Noise and Vibration
- Chapter 15: Traffic and Transportation
- Chapter 16: Major Accidents and Natural Disasters

Where appropriate, mitigation measures have been proposed to avoid, prevent, reduce or, if necessary, offset any identified significant adverse effects.

All activities carried out by the appointed Contractor of the Development will be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.

4.1.5 Scope of the Assessment

The effect of a development on population and human health includes the following broad areas of investigation:

- Population and Settlement Patterns;
- Economic Activity;
- Tourism;
- Employment;
- Topography and Land Use;
- Health Impacts of Wind Farms including Electromagnetic Fields;
- Property Value / Residential Amenity, and
- Natural Disaster and Major Accidents.

Where a significant negative impact can be foreseen, it is prevented, reduced, avoided or, if necessary, offset by way of practical mitigation measures.

This assessment considers the following criteria:

- Sensitive receptors in the area;

- Existing land use in the area;
- General amenities in the area, and
- Potential effects from water, noise, shadow flicker, air quality and traffic.
- Effects on the linguistic and cultural heritage of the Gaeltacht including the promotion of Irish as the community language

4.2 ASSESSMENT METHODOLOGY

In line with the EIA Directive as amended and current EPA guidelines, this Chapter includes the following elements:

- Details of Methodologies utilised in the context of legal and planning frameworks;
- Baseline Descriptions;
- Assessment of Potential Effects (do-nothing, construction, operational and decommissioning stages);
- Detailed Mitigation Measures;
- Assessment of Cumulative Impacts, and
- Summary of Significant Effects and Statement of Significance.

A desk study was undertaken using the Central Statistics Office (CSO) data along with a review of the Cork County Development Plan 2022-2028. Consideration was also given to the 2015[1] report produced by the EPA entitled 'Investigation into the Assessment of Health Impacts within National Environmental Regulation Processes' that outlines how human health impacts are dealt with, throughout the European Union (EU) by environmental regulators with an emphasis on the role at the planning / environment interface.

4.2.1 Definition of Study Areas

Three geographical Study Areas have been outlined for this assessment. While the greater geographical areas Study Area 2 and Study Area (3) provide a baseline of statistical data for this chapter, it is not considered for local impacts of this assessment. Note: Study Area 1 lies within Study Area 2 and information outlined for Study Area 2 incorporates data for Study Area 1. The three Study Areas as shown in **Figures 4.1, 4.2** and **4.3** are outlined below:

Study Area 1: The Site and Environs – District Electoral Division (DED) An Sliabh Riabhach (47.36 km^2).

In order to make inferences about the population and other statistics in the vicinity of the Site, DEDs were analysed. The wind farm entire Site comes under one Municipal Division (MD),

[1] Golder Associates (2015) *Investigation into the Assessment of Health Impacts within National Environmental Regulation Processes*. Available online at: http://www.epa.ie/pubs/reports/research/health/assessmentofhealthimpactsreport.html, [Accessed on 20/04/21]

Macroom, and electoral division (ED) An Sliabh Riabhach, that can be separated into distinct townlands; Inchamore, Milleeny, Derreenaling, Derrynasaggart, Slievereagh, Coomnaclohy, Coomnagire, Cappagh West, Cappagh East, Killeen, and Flats.

Study Area 2: Cork County (7,316 km^2) The Development and 5.99 km of the grid connection are located in Study Area 2.

Study Area 3: Kerry County (4,807 km^2) A section of the grid connection (13.89 km) and 1.047 km of the forest track from the site entrance to the N22 are located in Study Area 3.

Descriptive terminology for impact assessment follows the systematic method of description of the EPA Guidelines (2022), as outlined in **Chapter 1: Introduction, Table 1.4.**

4.2.2 Consultation

Consultation with relevant organisations was initiated during the initial stage of the EIA to identify any effects that could be initiated by the Development. A summary of the findings is detailed in **Table 4.1.**

Table 4.1: Summary of Consultation response on Human Health

Consultation response on Human Health		
Health Service Executive	Letter in Response to Scoping Report received on 10th December 2020	**Opportunity for Health Gain**: "The proposed development should be assessed with a view to the potential to include opportunities for health gain within the site of the proposed wind farm by including greenways, cycle-paths or walking trails within the development site." **Shadow Flicker**: It is recommended that a shadow flicker assessment is undertaken to identify any dwellings and sensitive receptors which may be impacted by shadow flicker. The assessment must include all proposed mitigation measures. Dwellings should include all occupied properties and any existing or proposed properties for which planning consent has been granted for construction or refurbishment. It is recommended that turbine selection will be based on the most advanced available technology that permits shut down during times when residents are exposed to shadow flicker. As a result, no dwelling should be exposed to shadow flicker.

Consultation response on Human Health		
Fáilte Ireland		• Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependent on its **Context, Character, Significance**, and **Sensitivity**, as outlined in the Draft Guidelines. These characteristics apply to both the development and the environment. • Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the Draft Guidelines and includes the quality, significance, extent, probability, type and duration of the effect, with particular descriptors for each. • Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism assets under the 'material assets' topic below. • The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section. • A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction for example should consider the sensitivity of the development and ensure mitigation is in place. • The construction programme of developments should work to avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals. • Cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact. • Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered. • Tourism could be considered a material asset as its impact upon the economy and the infrastructure in place to

Consultation response on Human Health		
		support it is a material consideration in assessing economic impact. • The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

4.3 BASELINE DESCRIPTION

4.3.1 Population and Settlement Patterns

Study Area 1: The Site and Environs (DEDs An Sliabh Riabhach, Clydagh and Coomlogane)

The extent of Study Area 1 can be seen in **Figure 4.1**. There are no defined community settlements with a population greater than 2,500 within Study Area 1. Macroom, which has a population of 3,765 persons is approximately 22 km distant east of the Project. The nearest centres of population to the Site are Killarney, Co. Kerry, 20 km distant to the north-west which has a population of 14,504 residents and Cork City, 50 km distant east which has a population of 208,669 persons. The surrounding area is largely rural, with a mixture of agricultural grassland, commercial forestry plantations, private roads and public roads. Isolated residences and farmsteads are also scattered throughout the area.

Nearby settlements to the Project located within Study Area 1 include the villages of Coolea 3.2 km southeast and Ballyvourney 5 km east. The Site and a section (1.03 km) of the grid connection are located in the Múscraí Gaeltacht. This Gaeltacht is made up of four native Irish speaking communities Ballyvourney, Ballingeary, Coolea and Clear Island. It covers an area of 626 km.

Over the last five years, Cork County Council and Kerry County Council have granted planning permissions in Study Area 1 which include housing, alterations to existing dwelling houses, development of new housing, agricultural buildings, and commercial developments including a solar farm[2]. The 2016 Census statistics note 348 occupied residences and a total population of 942 in Study Area 1. There were 485 number Males and 457 number Females. The population density of Study Area 1 is 6 persons per square kilometre.

[2] Cork County Council. *Planning Map Search* Available online at: https://www.corkcoco.ie/en/planning/planning-enquiry-online-submissions [Accessed 10th February 2023]

All inhabited dwellings are located at a distance of over 740 m from the proposed turbines. There are 39 properties within 2 km of the turbines as shown on **Figure 1.3**. The Site and its wider environs are classified as a 'Transitional Rural Area' in the Cork County Development Plan 2022-2028[3]. Although population concentrations are lower in these areas, there is a more stable population base and less evidence of population decline than other parts of the County. These ED areas also exhibit characteristics of a weaker economic structure and have higher levels of environmental sensitivity.

Study Area 2: Cork County

Preliminary data from Census 2022 shows the population of County Cork has increased by 7.1% to 581,231[4].The total population in the 2016 CSO for County Cork was 542,868, of which Males numbered 268,675 and Females were 274,193. There has been a 4.4% increase in the population since 2011. The population density is 256 persons per km^2. The total number of households was 146,442 in 2016, a 2.7% increase since 2011. Average size of households (in persons) has generally remained the same at 2.8-2.9 persons per household over the past three census reports.

Cork is the largest county in Ireland with a land mass of 7,500 km^2 including Cork City. The economic performance of Cork is strong and plays a critical role in both our regional and national economies. Cork contributes 19% to the national GDP.

The extent of County Cork can be seen in **Figure 4.2**. There are a number of medium sized towns and villages geographically spread throughout County Cork. These settlements number 102 and provide essential services for the local communities and the rural hinterlands. The different settlement tiers perform differing roles with the result that no area in the county is significantly peripheral or isolated.

The increase in rural population over a 5-year period from 2011 to 2016 in Cork County was 6,946. The towns of Carrigaline (15,770), Cobh (12,800), Midleton (12,496) and Mallow (12,459) are the most populated within the County.

Carrigaline, the largest town in County Cork, is significant for health, social and cultural activities. According to the Census 2016 there are 6,971 people residing in the Carrigaline settlement area who are classed as being 'At Work'. It has the largest number of workers (3,369) commuting into Cork city and suburbs. Carrigaline is 60 km distant from the Site to the south-east.

[3] Cork County Development Plan 2022-2028 Available online: https://www.corkcoco.ie/en/cork-county-development-plan-2022-2028 [Accessed 28th August 2022]
[4] Census 2022, https://data.cso.ie/, accessed 26/10/2022

Study Area 3: Kerry County

The extent of County Kerry can be seen in **Figure 4.3**. The total population in the 2016 CSO for County Kerry was 147,707, of which Males numbered 73,055 and Females were 74,652. There has been a 1.5% increase in the population since 2011. The population density is 31 persons per km^2. The total number of households was 54,493 in 2016, a 2.2% increase since 2011. Average size of households (in persons) has decreased over the period 2011 to 2016 from 2.8 to 2.6 persons. Preliminary data from Census 2022 shows the population of County Kerry has increased by 5.1% to 155,258.

There are a number of large and medium sized towns and villages geographically spread throughout County Kerry. These are broken down into Key Town, Regional Town, District Town, Village, and Small Village Settlements. The key element of the County Kerry Core & Settlement Strategy is to deliver 30% of all new homes in the Key Towns of Tralee and Killarney within the existing built-up footprint of the settlements. The overall aim for rural towns and villages is the strengthening of their social and economic structure by supporting the re-use of existing buildings and the regeneration of under-utilised buildings and lands[5].

The towns of Tralee and Killarney are considered Key Towns. These are key destinations, along transportation corridors and are economically active in the surrounding area. According to the Census 2016 the population of Tralee is 23,691 persons and Killarney is 14,504 persons. Tralee is 59 km distant from the Site to the north-west. Killarney is 28 km distant from the Site to the north-west.

4.3.2 Economic Activity

4.3.2.1 Primary Sectors

Study Area 1: The Site and Environs (DED An Sliabh Riabhach)

The main sectors in this Study Area are Professional services. This ED also exhibits characteristics of a stronger economic structure and have higher levels of environmental sensitivity.

Study Area 2: Cork County

The economy of County Cork is broadly based and diverse with strengths in the areas of agriculture/agri -tech, marine, food production, tourism, services, energy and in technology-based manufacturing in sectors such as electronics and life sciences. The Cork Region has the largest life sciences sector in employment terms in the country with almost 10,000

[5] Kerry County Development Plan 2022 -2028, http://docstore.kerrycoco.ie/KCCWebsite/planning/devplan/vol1updated.pdf , accessed 12/09/2022

permanent full-time jobs in the sector in 2016. Seven of the top ten global pharmaceutical companies have a presence in the county.

Cork also has a very significant agriculture and food sector. It has the most people employed in agriculture in the state. In 2010, the recorded numbers on farms in Cork was 14,222. This was 5.5% higher than the next highest at 13,445 in Galway[6]. with a number of indigenous enterprises having a significant international presence including Dairygold and Midleton Distillery. Danone and Kerry Foods are also present in Cork and together produce approximately 8% of the world infant milk formula[7].

4.3.3 Employment

4.3.3.1 Study Area 1: The Site and Environs (DED An Sliabh Riabhach)

Although population concentrations are lower in these areas, there is a more stable population base and less evidence of population decline than other parts of the County. Detailed information on employment for such a small area is unavailable. It is assumed that the majority of those residing within this area travel outside of it for employment. Please see Section 4.3.3.2 for more information on employment within the county.

4.3.3.2 Study Area 2: Cork County

According to the CSO 2016 there were 198,177 persons over 15 years of age in the labour force in Cork County and 91% were in employment. The Professional Services, the Manufacturing Industry and Commerce and Trade industries employ 110,842 persons. Of the 123,443 persons aged 15 years and over who were outside the labour force, 29% were students, 23% were looking after the home/family and 37% were retired. **Table 4.2** sets out employment by Industry in Cork County in 2016.

The live register figures show Cork County has seen a 42% decrease in registered unemployment since 2016. Between 2019 and 2020, numbers on the live register have risen, likely due to the economic downturn associated with the COVID-19 pandemic and Cork County has experienced a 4.3% rise in unemployment during that time.

[6] Life in 1916 Ireland: Stories from statistics https://www.cso.ie/en/releasesandpublications/ep/p-1916/1916irl/economy/ag/ [Accessed online 24/01/2022]

[7] County Development Plan Review, Economy and Employment, Background Document No.6, Planning Policy Unit, Cork County Council (2019), https://www.corkcoco.ie/sites/default/files/2019-12/Background%20Document%20no%206%20Economy%20and%20Employment.pdf, [Accessed online 12/05/2021]

Table 4.2: Cork County Employment by Industry (2016)

Principal Economic Status	No. Persons
At work	179,890
Looking for first regular job	1,827
Unemployed having lost or given up previous job	16,460
Student	35,933
Looking after home/family	27,965
Retired	45,612
Unable to work due to permanent sickness or disability	12,926
Other	1,007
Total	**321,620**

4.3.3.3 Study Area 3: Kerry County

CSO 2016 recorded 69,923 persons over 15 years of age in the labour force in County Kerry and 88% were in employment. The Professional Services, Commerce and Trade and Other industries employ 40,515 persons. Of the 48,993 persons aged 15 years and over who were outside the labour force, 24% were students, 20% were looking after the home/family and 45% were retired. **Table 4.3** sets out employment by Industry in County Kerry in 2016.

The live register figures show County Kerry has seen a 34% decrease in registered unemployment between 2011 and 2016. Between 2019 and 2020, numbers on the live register have risen slightly, likely due to the economic downturn associated with the COVID-19 pandemic. Based on the figures for January 2021 to May 2021, the live registers have fallen below the 2019 figure.

Table 4.3: Kerry County Employment by Industry (2016)

Principal Economic Status	No. Persons
At work	61,222
Looking for first regular job	835
Unemployed having lost or given up previous job	7,866
Student	11,849
Looking after home/family	9,585
Retired	21,855

Principal Economic Status	No. Persons
Unable to work due to permanent sickness or disability	5,238
Other	466
Total	**118,916**

4.3.4 Land Use

4.3.4.1 Study Area 1: The Site and Environs (DED An Sliabh Riabhach)

Study Area 1 is located in County Cork and County Kerry.

The Site is located within the electoral area of An Sliabh Riabhach, which supports 54 farm holdings, with an average holding size of 53 ha. The main livestock farmed are sheep and cattle[8].

ArcGIS Pro was used to calculate an area 796 ha forestry within Study Area 1. The majority of the forestry within Study Area 1 was classed as 'Coniferous Forest' according to CORINE Land Cover (Copernicus)[9].

4.3.5 Tourism

4.3.5.1 Tourist Attractions

Study Area 1: Development Site and Environs (10 km)

Tourist attractions (receptors) were collated using the suggested information sources outlined in the Fáilte Ireland EIAR Guidance document and using an internet search engine.

The Beara to Breifne Way, Ireland's longest national waymarked walking/cycling trail runs through part of the Study Area, it is not located within the Site (6 km at the closet point), however 640 m of the Grid Connection Route is along the Beara to Breifne Way see **Figure 4.4.** The Way runs almost the length of the country and takes the walker and cyclist to some of its most beautiful and least explored areas; along the coast of the Beara Peninsula, across six mountain ranges, along the banks of the River Shannon and through the lake regions of Roscommon and Leitrim.

There are two scenic routes located within Study Area 1. Scenic route S23 (road between Macroom and Derrynasaggart Mountains) is 149 m from the red-line boundary and 860 m from the Site. Scenic route S22 (road from Ballyvourney to Mullaghanish to Caherdowney) is located 5.6 km from the Site and 730 m from the grid connection at the closest point as shown on **Figure 4.4.**

[8] Census of Agriculture 2020, CSO, agri@cso.ie, Accessed 14/05/2021.
[9] Environmental Protection Agency Maps https://gis.epa.ie/EPAMaps/ [Accessed Online_22/06/2022]

Comeenatrush Lake and Waterfall walk are located 1.4 km north of the grid connection at the closest point and 12 km north-east of the Site.

St Gobnait's monastic site is located 5.6 km south-east of the Site. On the feast day of St Gobnait (11th February) pilgrims travel to Ballyvourney to visit St Gobnait's statue to bring them good health and good fortune.

Gougane Barra located 13 km south-west of the Site is a popular tourist village famous for its small 11th century St Finbarrr's Oratory built on a peninsula. The area around Gougane Barra is part of the Múscraí Gaeltacht. The village is set in a spectacular landscape known for its tranquillity, the beauty of the Gougane Lake and its numerous walking trails. Coillte Forest Park at Gougane Barra offers numerous walks for all ability levels, among the Sitka Spruce, beside the winding River Lee or past waterfalls tucked into the mountainside[10].

The are no existing walking tracks or trails within the Site, there are numerous forest tracks currently used by walkers for recreation purposes throughout the Study area.

Taking into account the availability of existing walking tracks, it is considered that the main tourism and recreation in Study Area 1 is trail walking, hiking and cycling or mountain biking.

Study Area 2: Cork County

Tourism in County Cork is an important industry based on its rich natural and built heritage. Many areas that are important to the tourist industry of County Cork owe their attraction to the exceptional quality of the landscape or particular features of the built environment[11]. There are a number of policies in the Cork County Development Plan 2022 which seek to promote tourism in the county. Policy TO 1-2: Promotion of Sustainable Tourism in County Cork is '(a) *Promote a sustainable approach to the development of the tourism sector within Cork County .....*" and Policy TO 7-1: Walking/Cycling and Greenways is "*Promote the development of walking and cycling routes throughout the County as an activity for both international visitors and local tourists…*"

Study Area 3: Kerry County

Kerry attracts 13% of all overseas visitors to Ireland. Kerry is more dependent on tourism than any other county with over 20% of its workforce employed in tourism-related enterprises. There are over 9,000 people directly employed in the accommodation and hospitality sectors in Kerry. It has the greatest concentration of tourist accommodation outside of Dublin – up to 50,000 beds in the approved and unapproved sectors.

[10] Failte Ireland, West Cork Digital Brochure (2021), Accessed 11/08/2021.
[11] County Development Plan 2022, Section 10, https://www.corkcoco.ie/sites/default/files/2022-06/volume-1-main-policy-material.pdf, [Accessed Online_27/06/2022]

Kerry County Council published a tourism strategy in 2016 for the period 2016 to 2022. The plan has a number of objectives including "*Increase the number of visitors to the county, their length of stay and their spend, and to do so in a manner that is sustainable*." The strategy will be achieved by the implementation of 273 individual actions.[12]

Some of the most popular tourist attractions in County Kerry include the Ring of Kerry, the lakes of Killarney, Skellig Michael, Dingle, Killarney National Park. Killarney National Park was voted number eight in the top ten paid tourist attractions in 2018 in Ireland and the Lakes of Killarney are the closest tourist attractions to the Project, located 17 km north-west and 11 km north-west of the Project at the nearest point respectively.

4.3.5.2 Tourism: Numbers and Revenue

Study Area 1: Development Site and Environs (10 km)

Tourist numbers and revenue data is only available for larger towns or at county level. Although the data is unavailable for Study Area 1 tourist sites such as Goungane Barra welcomes over 60,000 visitors each year[13].

Study Area 2: Cork County

The South-West Region which includes the Counties of Cork and Kerry has consistently been the most popular region in Ireland outside Dublin for overseas tourist and domestic visitors. Regional Tourism performance figures for 2018 for the South-West Region show overseas tourist numbers for the South-West Region totalled 2,335,000 in 2019 and tourist revenue accounted for €970,000,000 from overseas tourists. Domestic visitors from Ireland and Northern Ireland accounted for 2,354,000 visits to the region in 2019, with €536,000,000 in revenue generated from domestic and Northern Ireland visitors[14].

County Cork is home to a number of nationally renowned visitor attractions including Blarney Castle and Blarney Stone, Ballycotton Cliff Walk, Cobh, Doneraile Park and Spike Island. Doneraile Park was one of the top free of charge attractions visited in 2019 with 490,000 visitors. Blarney Castle and Stone was one of the top fee charging attractions with 460,000 visitors.

Cork is also included in 'Wild Atlantic Way" which is one of the longest defined coastal routes in the world (located 33 km south-west of the Project). It was devised as a new 'experience'

[12] County Kerry Tourism and Action Plan 2016 – 2022, Kerry County Council & Destination Tourism Forum, 2016,
[13] Failte Ireland (2012) Visitors to Tourist Attractions 2007 -2011
[14] Key Tourism Facts 2019, Failte Ireland, March 2021, http://docstore.kerrycoco.ie/KCCWebsite/Tourism/TourismStrategy.pdf, accessed 12/05/2021https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/Key-Tourism-Facts-2018.pdf?ext=.pdf, accessed 12/05/2021

and 'destination' by Fáilte Ireland to present the West Coast of Ireland as a compelling international tourism product. It is an over-arching brand which individual destinations and businesses can trade collectively with much greater potential visibility and clarity of message in the international marketplace[15].

Study Area 3: Kerry County

As previously stated, the South-West Region which includes the County Kerry has consistently been the most popular region in Ireland outside Dublin for overseas tourist and domestic visitors. Some of the top visitor attractions in Ireland are located in Kerry including Muckross House, Dingle, The Ring of Kerry, Carrauntoohil, Ross Castle as well as Blasket Island and Skellig Michael. In 2018 Muckross House was one of the top visited fee charging attractions with 550,649 visitors.

4.3.5.3 Visitors Attitudes to Wind Farms

The first wind farm in Ireland was completed in 1992 at Bellacorrick, Co. Mayo and since then wind farms have elicited a range of reactions from Irish people (Failte Ireland, 2012). In 2002, Sustainable Energy Ireland (SEI) now the Sustainable Energy Authority of Ireland (SEAI) commissioned a survey aimed at identifying public attitudes to renewable energy, including wind energy in Ireland[16]. The 2002 survey found that, in general, Irish people are positively disposed towards the development of wind farms. However, the survey also indicated that people will not accept wind farms everywhere and that special care should be taken so that wind farms respond to contextual landscape characteristics.

Ireland's scenery has been a cornerstone of international tourism marketing campaigns for decades. In 2012, 91% of overseas holidaymakers to Ireland rated scenery as an important part of a destination with natural/unspoilt environment also rated highly at 91%. The future sustainability of Ireland's tourism industry is therefore inextricably linked to the maintenance of the character and scenic qualities of the Irish landscape.

Fáilte Ireland, in association with the Northern Ireland Tourist Board (NITB), decided in 2007 (67 wind farms established) to survey both domestic and overseas holidaymakers to Ireland to determine their attitudes to wind farms. The survey drew on many aspects of the original SEI survey including the photomontages of wind farms, and in particular, the landscape types that were used to elicit a reaction from respondents. The purpose of the survey was to assess

[15] Wild Atlantic Way1 Operational Programme 2015-2019, Failte Ireland, August 2015, https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/Key%20Projects/Wild-Atlantic-Way-Operational-Programme_1.pdf, accessed 12/05/2021

[16] Sustainable Energy Ireland (2003), Attitudes towards the Development of Wind Farms in Ireland, Dublin

whether or not the development of wind farms would impact on the visitors' enjoyment of Irish scenery. In 2012, this research was updated by Millward Browne Landsdowne on behalf of Fáilte Ireland to determine if there was any change in visitor attitudes during this period.

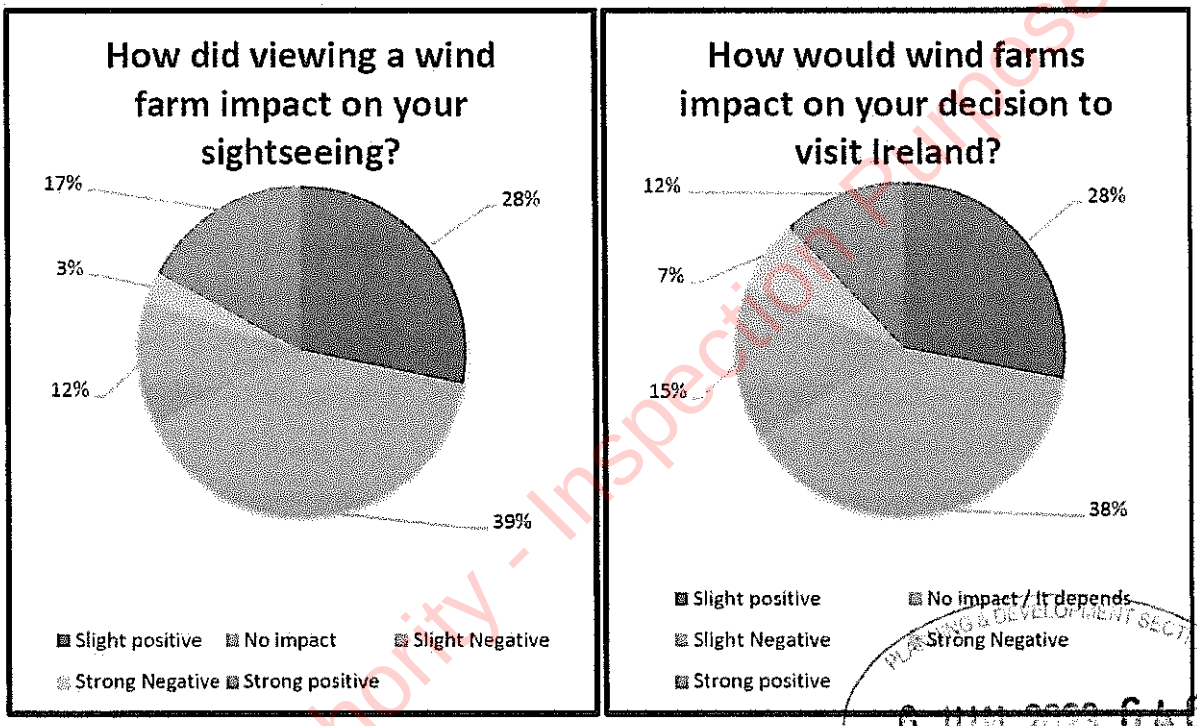
The 2012 research indicated that 47% of visitors felt an increased positive impact on landscape, compared to 32% in 2007. Negative responses also increased, showing 30% in 2012 against 17% in 2007. However, 49% of visitors felt that wind farms had no impact on the landscape in 2007 in comparison to 23% in 2012. It was notable that those interviewed who did not see a wind farm during their trip held more negative perceptions and opinions on wind farms to those that did. Of the wind farms viewed, the majority (59%) contained less than ten turbines in 2012, which was quite similar to 2007 (63%).

Despite the fact that there has been an increase in the number of visitors who have seen at least one wind farm on their holiday, there was also a slight increase (from 45% in 2007 to 48%) in the number of visitors who felt that this had no impact on their sight-seeing experience. Importantly, and as has been seen in the previous research, the type of landscape in which a wind farm is sited can have a significant impact on attitudes. Although 21% feel that wind farms have a fairly or very negative impact on sight-seeing, this figure increases substantially for wind farms in coastal areas (36%).

Visitors were again asked to rate the beauty of five different yet typical Irish landscapes: coastal, mountain, farmland, bogland and urban industrial land, and then rate the scenic beauty of each landscape and the potential impact of siting a wind farm in each landscape. As in 2012, the results indicate that each potential wind farm and site must be assessed on its own merits, due to the scenic value placed on certain landscapes by the visitor and the preferred scale/ number of wind turbines within a wind farm. Looking across all landscapes, wind farms are seen to have an enhancing effect on the landscapes. They are seen as less beautiful, particularly urban/ industrial and bogland.

Coastal areas (91%) followed by mountain moorland (83%) and fertile farmland (81%) continue to be rated as the most scenic, and unsurprisingly resistance is greatest to wind farms in these areas. For instance, there was a greater relative negativity expressed about potential wind farms on coastal landscapes (40%), followed by fertile farmland (37%) and mountain moorland (35%). On the other hand, less than one in four were negatively disposed to the construction on bogland (24%) or urban industrial land (21%). The majority of visitors also still favour large turbines (47%) over small turbines (28%), and in smaller numbers, with the option of five turbines proving the most popular, followed by two clusters of ten and finally wind farms of 25 turbines.

Seven out of ten (or 71%) visitors claim that potentially greater numbers of wind farms in Ireland over the next few years would have either no impact or a positive impact on their likelihood to visit Ireland (**Graph 4.1**). Of those who feel that the potentially greater number of wind farms would impact positively on future visits, the key driver is support for renewable energy, followed by potential decreased carbon emissions. Given the scenario where more wind farms will be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again, with a slightly greater majority saying that this would have a positive rather than a negative impact.



Graph 4.1: Visitors Attitudes on the Environment – Wind Farms. Source: Fáilte Ireland (2008)

Fáilte Ireland carried out research on Overseas Holidaymakers Attitudes to Ireland in 2018. It noted holiday makers choice is based largely on *beautiful scenery* (93%), followed closely by *plenty to do and see* (91%) and *friendly people* and *natural attractions* (88%). BiGGAR Economics carried out research in Scotland on 28 wind farms and tourism trends (2017)[17]. No pattern emerged that would suggest that onshore wind farm development has had a detrimental impact on the tourism sector, even at a very local level. No relationship was identified between the development of onshore wind farms and tourism employment at the level of the Scottish economy, at local authority level nor in the areas immediately surrounding wind farm development.

[17] BiGGAR (2017) Wind Farms and Tourism Trends in Scotland. Available online at: https://www.lyrewindfarm.com/web/cms/mediablob/en/3949334/data/3878350/2/windfarm-lyre/Wind-farms-and-tourism-trends-in-Scotland.pdf [Accessed on 13/11/2019]

4.3.6 Human Health

Common concerns around wind farms in terms of human health are generally associated with electromagnetic fields, shadow flicker and noise. These topics are considered in this assessment in addition to air quality, water contamination and traffic.

4.3.6.1 General Health of Population

Human health of communities can vary greatly owing to a number of factors including susceptibility to disease, location, income inequality, access to health care etc. In 2019 the Department of Health published "Health in Ireland – Key Trends 2019" which shows population health at the national level presents a picture of decreasing mortality rates and high self-perceived health over the past ten years. Ireland has the highest self-perceived health status in the EU, with 82.9% of people rating their health as good or very good.

The 2016 census data for the general health of the population as shown in **Table 4.4** indicates the health status across all four study areas is "Very Good" to "Good". The health status of the Site and Environs is very similar to that of County Cork. Both these areas are above the national average. The "Very Good" health status for County Kerry at 56% is slightly below the national average of 59%.

Table 4.4: Population by General Health (2016)

General Health	The Site & Environs (10 km)	County Cork	County Kerry	Ireland
	Percentage (%)			
Very good	64	63	56	59
Good	26	26	30	28
Fair	7	7	9	8
Bad	1	1	1	1
Very bad	0	0	0	0
Not stated	2	2	4	3

4.3.6.2 Electromagnetic Interference

Electromagnetic fields ("EMF") are invisible lines of force that surround electrical equipment, power cords, wires that carry electricity and outdoor power lines. Electric and magnetic fields can occur together or separately and are a function of voltage and current. When an electrical

appliance is plugged into the wall, an electric field is present (there is voltage but no current); when that appliance is turned on, electric and magnetic fields are present (there is both voltage and current). Both electric and magnetic fields decrease with distance. Electric fields are also dissipated by objects such as building materials. On a daily basis, people are exposed to extremely low frequency ("ELF") EMF as a result of using electricity.

National and international health and scientific agencies have reviewed more than 35 years of research including thousands of studies. None of these agencies has concluded that exposure to ELF-EMF from power lines or other electrical sources is a cause of any long-term adverse effects on human, plant, or animal health. The International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines give a limit of 100 µT for sources of AC magnetic fields. This compares to 0.13 µT that arises from a 110 kV underground cable when directly above it; 1.29 µT that arises from a 220 kV underground cable when directly above it and 11.4 µT that arises from a 400 kV AC underground cable that is one metre deep and measured directly above it. This is detailed in information booklet published by ESB in 2017 called "EMF & You" which provides information about Electric & Magnetic Fields and the electricity network in Ireland[18].

In 2014 a study was undertaken in Canada[19], measuring electromagnetic fields around wind farms and the impact on human health. The study found that:
"there is nothing unique to wind farms with respect to EMF exposure; in fact, magnetic field levels in the vicinity of wind turbines were lower than those produced by many common household electrical devices and were well below any existing regulatory guidelines with respect to human health".

From the limit of 100 µT for sources of AC magnetic fields given by the ICNIRP, a comparison of between 0.02 µT and 0.41 µT arises when turbines operate under "high wind" scenarios.

4.3.6.3 Shadow Flicker

The Department of Energy and Climate Change for England stated in its report Update of UK Shadow Flicker Evidence Base (2011) that it is considered that the frequency of the flickering caused by the wind turbine rotation is such that it should not cause a significant risk to health.

Section 4.6 provides the full assessment of shadow flicker for this EIAR.

[18] EMF & You, ESB, 2017 - https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0, accessed 14/05/2021
[19] Lindsay C McCallum, *et al.* (2014) *Measuring electromagnetic fields (EMF) around wind turbines in Canada: is there a human health concern?*

4.3.6.4 Noise

A study by the EPA in South Australia on low frequency noise near wind farms and in other environments found that *'Overall, the study demonstrates that low frequency noise levels near the wind farms in the study are no greater than levels in urban areas at comparable rural residences away from wind farms'.*

The turbine rotor blades will be fitted with a serrated extension of the trailing edge which will reduce noise emissions by design by effectively breaking up turbulence. Baseline noise measurements were carried out from 11th October to 9th November 2020. A number of predictions were prepared for the layout of the five turbine Development. Based on layout, potential noise-sensitive receptors including occupied and un-occupied were identified from maps. Receptor locations were verified through visits to the area. **Chapter 11: Noise** provides an assessment of noise in relation to the Development.

4.3.6.5 Air Quality

Environmental Protection Agency (EPA, 2016), EU and World Health Organisation (WHO, 2014) reports estimate that poor air quality accounted for premature deaths of approximately 600,000 people in Europe in 2012, with 1,200 Irish deaths attributable to fine particulate matter ($PM_{2.5}$) and 30 Irish deaths attributable to Ozone (O_3)[20] [21]. These emissions, along with others including nitrogen oxides (NO_x) and sulphur oxides (SO_x) are produced during the burning of fossil fuels for energy generation, transport or home heating. There are no such emissions associated with the operation of wind turbines.

Traffic disruption to the public during the construction and decommissioning phases of the Development is likely. Transport accounts for a significant portion of pollutants in the atmosphere. Potential impacts are discussed in Section 4.4.6.

Chapter 10: Air and Climate provides an assessment of air quality in relation to the Development.

4.3.6.6 Water Contamination

Contaminants such as sediments arising from the Development have the potential to contaminate water bodies designated for drinking water purposes and may cause ecological damage as well. Mitigations as set out in **Chapter 9: Hydrology and Hydrogeology** will prevent and reduce risk of contamination of waterbodies. The drainage design and surface

[20] www.euro.who.int/en/health-topics/environment-and-health/air-quality/news/news/2014/03/almost-600-000-deaths-due-to-air-pollution-in-europe- new-who-global-report, accessed 10th May 2021
[21] Irelands Environment 2016 – An Assessment', EPA, 2016, accessed 10th May 2021

water network are considered in terms of assimilative capacity, that is to dilute contaminants in receiving waterbodies as a 'last line of defence'. Any contaminants will be treated when water is abstracted for drinking water purposes.

A review of the GSI well database indicates there are no mapped wells within the Site boundary. Governing industry guidelines stipulate a buffer zone of 250 m is required from boreholes used for drinking water abstraction. The closest mapped wells are more than 1 km from the boundary of the Site. All houses including wells are over 740 m from the Site and can be considered outside the 250 m buffer.

Chapter 9: Hydrology and Hydrogeology provides an assessment of the hydrological impacts in relation to the Development, including the potential for water contamination.

4.3.6.7 Traffic

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed at Ringaskiddy Port, County Cork and will be transported on the N22 to the site entrance.

Receptors considered as having 'high' sensitivity are primarily business premises which are directly on the N28 and N22 which have significant potential to generate traffic.

The sensitive receptors are assessed in **Chapter 15: Traffic and Transportation.**

4.3.6.8 Health Impact Studies

While there are anecdotal reports of negative health effects on people who live near operational wind farms there is no peer reviewed scientific research in support of these views. In contrast, several peer reviewed scientific research publications outlined below conclude that wind turbines are not related to adverse impacts on human health.

Frontiers in Public Health published a study[22] in 2014 on wind turbines and human health. This review summarised and analysed the science in relation to this issue specifically in terms of noise (including audible noise, low-frequency noise, and infrasound), EMF, and shadow flicker. The study noted that:

"*Based on the findings and scientific merit of the research conducted to date, it is our opinion that the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health effects. This claim is supported (and made) by findings from a number of government health and medical agencies and legal decisions*".

[22] L. D. Knopper, *et al.* (2014) *Wind turbines and human health.*

The National Health and Medical Research Council, Australia's leading medical research body, concluded that there is no reliable or consistent evidence that wind farms directly cause human health problems as part of their Systematic Review of the Human Health Effects of Wind Farms published in December 2013. The review was commissioned to determine whether there is a direct association between exposure to wind farms and negative effects on human health or whether the association is casual, by chance or bias.

Objectors to wind farms often refer to wind turbine syndrome as a condition that can be caused by living in close proximity to wind farms. The symptoms allegedly include sleep deprivation, anxiety, nausea and vertigo. It has been rejected by the wind industry as there is no scientific backing to these claims. This Systematic Review of the Human Health Effects of Wind Farms began in late 2012 and included a literature and background review of all available evidence on the exposure to the physical emissions produced by wind turbines. These emissions were noise, shadow flicker and electromagnetic radiation produced by wind turbines. The review concludes that the evidence considered does not support any direct association between wind farms and human health problems and that confounding bias could be possible explanations for any reported association.

In general, there are no specific health considerations in relation to the operation of a wind turbine. The area surrounding the turbine base will still be available for use. Noise and Shadow Flicker are operational Health and Safety issues, which have been addressed in **Chapter 11: Noise** and **Section 4.6 below**.

4.3.6.9 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s '*Wind Energy Development Guidelines for Planning Authorities 2006*' state that there are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations. People or animals can safely walk up to the base of the turbines. The DoEHLG Guidelines state that there is a very remote possibility of injury to people from flying fragments of ice or material from a damaged blade. However, most blades are composite structures with no bolts or separate components and the danger is therefore minimised. The build-up of ice on turbines is unlikely to present problems. The wind turbines will be fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will prevent the turbine from operating until the blades have been de-iced.

Turbine blades are made of fibre-reinforced polymer or unsaturated polyester, a non-conducting material which will prevent lightning strikes. Lightning protection conduits will be integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, will follow the electrical cable, from the nacelle to the base of the turbine. The conduction cables will be earthed adjacent to the turbine base. In extremely high wind speed conditions, (usually at Beaufort Storm Force 10 or greater) the turbines will shut down to prevent excessive wear and tear, and to avoid any potential damage to the turbine components.

4.3.7 Property Value

There are currently no Irish studies undertaken to assess the impact of wind farms on property prices. However, a number of studies have been undertaken in the UK, with findings set out in **Table 4.5**.

A study on 'the effect of wind farms on house prices' was undertaken in 2014 by the Centre of Economic Research. The study found that house prices were driven by the property market and not the presence or absence of wind farms[23]. Another study on 'Valuing the Visual Impacts of Wind turbines through House Prices' was undertaken in 2014 by the London School of Economics and it found the presence of wind farms negatively impacted property values within 2 km of very large wind farms[24]. However, in 2016, following on from the contrasting results of the two 2014 studies, ClimateXChange carried out their own research in Scotland. The ClimateXChange study found no significant effect on the change in price of properties within 2 km or 3 km, and found the effect to be positive[25]. This study also found that some wind farms can provide economic and amenity benefits to an area. The Development will include for the upgraded tracks that can be used by walkers within the Coillte owned areas of the Site and will provide a significant community benefit fund for the local area.

[23] https://cdn.ymaws.com/www.renewableuk.com/resource/resmgr/publications/reports/ruk-cebr-study.pdf [Accessed 27/01/2022]
[24] http://eprints.lse.ac.uk/58422/1/__lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_SERC%20discussion%20papers_2014_sercdp0159.pdf [Accessed 27/01/2022]
[25] Heblich, D. S., Olner, D. D., Pryce, P. G. & Timmins, P. C., 2016. *Impact of wind turbines on house prices in Scotland,* Scotland: ClimateXChange. [Accessed 27/01/2022]

Table 4.5: Summary of Research findings between Wind Farms and Property Values

Year	Country	Research Group	Finding
2014	UK	Centre of Economic Research	In summary the analysis found that country-wide property market drives local house prices, not the presence or absence of wind farms; and The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5 km radius of the sites.
2014	UK	London School of Economics	There was an average reduction in the value of houses (based on 125,000 house sales between 2000 and 2012) of between 5% and 6% within 2 km of very large wind farms.
2016	UK (Scotland)	ClimateXChange	Following a wide range of analyses, including results that replicate and improve on the approach used in the 2014 study by London School of Economics, the study did not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2 km or 3 km or find the effect to be positive. Some wind farms provide economic or leisure benefits (e.g. community funds or increasing access to rural landscapes through providing tracks for cycling, walking or horse riding)

4.3.8 Natural Disasters and Major Accidents

A wind farm is not a recognised source of chemical pollution. Should a major accident or natural disaster occur, the potential sources of pollution onsite during both the construction and operational phases are limited. Sources of chemical pollution with the potential to cause significant environmental pollution and associated negative effects on health include bulk

storage of hydrocarbons or chemicals and storage of wastes. Spills and leaks can occur if they are not mitigated against which may cause negative effects to human health, if contamination of food or water occurs. The occurrence of such spills and leaks is unlikely as bunding and safe storage practices will be complied with. **Chapter 16: Major Accidents and Natural Disasters** and **Appendix 2.1: Construction Environmental Management Plan** discusses this in more detail. The Site is not regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e., SEVESO sites and so there is no potential effect from this source. All SEVESO sites are located 30 km or more from the Development.

There is limited potential for significant natural disasters to occur at the Site. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to peat-slide, flooding, fire and their increased risk due to climate change.

With reference to **Chapter 8: Soils and Geology, Section 8.3.3.** The proposed infrastructure will be located on Devonian sandstone, namely Gun Point Formation which is comprised of Green-grey sandstone & Purple siltstone. Sandstone is usually within the range of Weak (5-25 Mega Pascals) to Medium Strong (25-50 MPa) and Siltstone is usually within the range of Very Weak (1-5 MPa) to Weak (5-25 MPa).

Geological features and destructive fault lines associated with the above-mentioned Formations give rise to the character of the topography at the Site. This has resulted in areas with steep slopes and/or complex topography densely populated with bedrock outcrops. Bedrock proximal to these fault lines will likely be fractured and/or weathered.

The Peat Stability Assessment Risk Ranking ranged from *'Very Low'* to *'Moderate'*. The risk of peat-slide is further addressed in **Chapter 8: Soils and Geology**. A Peat and Spoil Management Plan has been prepared in **Appendix 2.1**.

There are no recorded localised flood events within the immediate area of the Site. A Surface Water Management Plan has been put in place and can be found in **Appendix 2.1**. The risk of flooding is addressed in **Appendix 9.1: Flood Risk Assessment**.

A 2020 article in Wind Power Engineering Magazine estimated that 1 in 2,000 wind turbines catch fire each year[26]. Overall, the data shows that wind turbine fires are relatively rare[27]. It is therefore considered that the risk of significant fire occurring, affecting the wind farm and causing the wind farm to have significant environmental effects is negligible.

As described earlier, there are no significant sources of pollution in the wind farm with the potential to cause environmental or health effects. Also, the spacing of the turbines and distance of turbines from any properties limits the potential for impacts on human health. The issue of turbine safety is addressed in **Section 4.3.6.9**.

4.4 ASSESSMENT OF POTENTIAL IMPACTS

4.4.1 'Do-Nothing' Scenario

If the Project was not to proceed, the existing uses of the site for agriculture and commercial forestry would continue. The opportunity to capture a renewable green energy supply would be lost, as would the opportunity to contribute to Ireland's 2050 target of net-zero emissions. The opportunity to generate local employment and tourism would also be lost.

4.4.2 Population and Settlement Patterns (including Irish Language and Residential Amenity)

The Development does not contain a housing or services element and is not considered to have any direct, long term, positive or negative impact on the local or regional population levels. However, construction workers (25 workers at the peak of the construction phase) who are not based locally may temporarily relocate to the region for the project duration of 21 months, this is more likely for the initial construction and decommissioning phase than for the operational phase. The overall impact is considered to be imperceptible in terms of population.

The predicted effect on the immediate settlement patterns and social patterns is also slight to non-existent. There is, however, the benefit which will accrue to the region in terms of the ability to provide electricity to industry and business via a high-quality supply. This will lead to the region becoming more attractive to business with the subsequent benefit of increased employment opportunities in the region. A renewable, green energy supply will be attractive for companies looking to develop in County Cork.

[26] https://www.windpowerengineering.com/is-rope-based-descent-emergency-evacuation-at-the-end-of-its-tether/ [Accessed 27/01/2022]
[27] https://www.firetrace.com/fire-protection-blog/wind-turbine-fire-statistics [Accessed 27/01/2022]

During the construction phase there is the potential for limited impacts on the residential amenity of the local population. These will be short-term impacts relating primarily to an increase in construction traffic causing noise, dust, and an increase in traffic volume. The impacts of each on nearby properties have been found to be slight negative in the construction and decommissioning phases and imperceptible in the operational phase (see **Chapter 10: Air and Climate**, Sections 10.2.7; **Chapter 11: Noise and Vibration**, Section 11.4; and **Chapter 15: Traffic and Transportation**, Section 15.5.

The Project will see 25 persons working on the Project during the peak of the construction phase, two during the operation phase and 10 persons during the decommissioning phase. While the Project is not likely to result in a marked increase in settlement in the area, or a change in social patterns in the area, it will provide a renewable energy source which will prove attractive to certain types of industry depending on national and global economic conditions.

The Project is located within the Múscraí Gaeltacht area. While the construction phase will see the arrival of construction workers to the area, this will be a short-term occurrence and will not result in permanent settlement of the area by non-Irish speakers. The Project is, therefore, predicted to result in a negligible, indirect, not significant impact on the Irish language and cultural heritage of the Gaeltacht during the construction phase. Please see **Chapter 14: Cultural Heritage** for more details.

The overall impact of the construction and decommissioning phases on population and settlement patterns is predicted to be slight positive and short-term in nature should construction workers relocate to the area for the duration of these phases. The overall impact during the operational phase is predicted to be slight positive at the local level in terms of settlement patterns where increased business is attracted to the region.

4.4.3 Economic Activity

During the construction phase, there will be economic effects resulting from the expenditure on items such as Site preparation, Site Access Roads, purchase and delivery of materials, plant, equipment and components. Information provided by the Developer based on experience at other wind farms and various reports outlined in Section 4.4.4 indicates that there is expected to be a peak onsite workforce of maximum 25-workers. Some of these workers will be sourced from the local labour market where possible in Study Area 2 and Study Area 3, but professional and skilled personnel may be required to be sourced from areas across Ireland or further afield.

During the initial decommissioning and construction phase, jobs are likely to be created. Local employment will be provided, as well as employment on local, national and international levels both directly and indirectly. International employment will involve the manufacturing of wind turbines and the shipment of these components to Ireland. Throughout the project lifetime, employment will be both created and maintained on local, regional, national and international levels.

It is envisaged that labour and materials will be sourced from the local area during construction where possible (See **Chapter 15: Traffic and Transportation**). Ready-mix concrete will also be sourced from local suppliers (See **Chapter 15: Traffic and Transportation),** again subject to authorisation, and to quality and quantity being available.

Employees involved in the construction of the Development will most likely use local shops, restaurants and hotels/accommodation. Therefore, overall, there will be a slight, positive impact on employment in the locality. Employees also involved in the subsequent operation and decommissioning of the Development will use local shops, restaurants and hotels/accommodation.

BVG Associates carried out extensive assessments on the economic benefits from eight onshore wind farms in Southwest Scotland[28]. Each contract value was assigned to one or more relevant elements of a supply chain. Capital expenditure (CAPEX) was found to relate to turbine, civil works and electrical works supply chains, whereas the operational expenditure (OPEX) relates to transmission operations, maintenance and service (OMS) supply chain, the wind farm OMS and also the decommissioning supply chain.

Based on this research and the 28 to 33 MW range of capacity proposed for this project, the CAPEX for the Development is estimated to be approximately €65 to €75 million. This expenditure will result in economic benefit at a national, regional and local level. The OPEX in nominal terms is estimated to be €75 to €90 million. The BVG report found, for the eight projects studied, that 66% of the total project spend (CAPEX & OPEX) was retained within the National economy, 17% of the total was retained in the local region hosting the project.

Cork County Council will benefit from payments under both the Development Contribution Scheme and from annual rate payments. The Applicant is also committed to a 'Community Benefit' package. This package will be advertised annually and managed by the local community or an independent body on behalf of the local community. The purpose of the

[28] Economic Benefits from onshore wind farms, September 2017, BVG Associates, accessed 18/05/21

community fund is to enable the local community to share in the benefits of the Development. FuturEnergy Ireland and SSE's community benefits funds typically support local projects, with funds allocated to projects from all aspects of the community.

The overall impact on economic activity is predicted to be a moderate, positive, short-term impact during the construction phase of the Development and moderate, positive and long-term during the operational phase. There will be similar effects to the construction phase during decommissioning.

4.4.4 Employment

The employment effects that are attributable to the Development can be outlined as direct, indirect and induced.

Direct: Employment and other economic outputs that are directly attributable to the delivery of the Development. These include any new jobs that are created to manage and supervise the construction phase, operational and decommissioning phases of the Development and that are filled by employees of the Developer or the appointed Contractor (or sub-contracted employees).

Indirect: Employment and other outputs created in other companies and organisations that provide services to the Development, (i.e. procurement and other supply chain effects). Most manufactured materials like towers, blades and subcomponents are assumed to be imported (import intensity of 66%) with major infrastructure delivery through Ringaskiddy Port; fewer indirect manufacturing jobs will be generated domestically in Ireland.

Induced: Additional jobs and other economic outputs that are created in the wider economy, as a result of the spreading of employee incomes and other ripple effects that occur as a result of the direct and indirect effects of the Development.

Sustainable Energy Authority of Ireland (SEAI) researched the flow of investment and sales revenue from onshore wind and the transmission grid through the different industrial sectors in the supply chain required for input–output macro-analysis (**Table 4.6**).

Table 4.6: Capital Investment breakdown for onshore wind supply (Source SEAI, 2015 [29])

	Industrial Sectors
€192 million average annual capital investment to reach 2020 NREAP/NEEAP targets	Manufacturing (70%): turbines, blades, towers, gearbox, generator, electrical equipment, transformer etc.
	Construction (12%)
	Electricity Supply Services (10%)
	Transport (2.5%)
	Finance (2.5%)
	Professional Services (3%)

In terms of its capacity to capture capital investment domestically, Ireland has strong indigenous feasibility, planning, foundations and engineering expertise, with the skills and knowledge base to potentially supply niche markets in controls and instrumentation, albeit the bulk of heavy manufacturing (blades, towers) is imported. Similarly, the Irish supply chain is very well positioned in all of the preliminary design and operational aspects of the electricity grid, providing a significant boost to national employment. However, some manufactured materials such as cables, underground pipes, insulators and conductors are sourced from abroad.

According to SEAI, there are 0.34 new long-term jobs per MW, which falls in line with European Wind Energy Association (EWEA) estimates for direct employment in Europe. In the case of the Development, this translates to 9-11 new long-term jobs for a 28 – 33 MW powered installation.

According to Institute for Sustainable Futures document (2015)[30], 3.2 jobs are created per MW of wind energy development during the construction and installation phase, the report assumes a 2-year construction period. Based on this employment estimate and a twenty-one-month construction phase, between 78 and 92 jobs could be created during the construction phase (for an installed capacity of between 28 – 33 MW).

[29] A Macroeconomic Analysis of Onshore Wind Deployment to 2020 An analysis using the Sustainable Energy Economy Model, SEAI, 2015. [Accessed Online 29/06/2022] Available at: https://www.seai.ie/publications/A-Macroeconomic-Analysis-of-Onshore-Wind-Deployment-to-2020.pdf

[30] Institute for Sustainable Futures, Calculating Global Energy Sector Jobs – 2015 Methodology Update, 2015. [Accessed Online 27/06/2022] Available:https://opus.lib.uts.edu.au/bitstream/10453/43718/1/Rutovitzetal2015Calculatingglobalenergysectorjobsmethodology.pdf

According to the European Wind Energy Association's (EWEA) Report 'Wind at Work' (2009)[31], 1.2 jobs per MW are created during installation of wind energy projects based on 1 year construction period. Using this figure, a projection of between 59 and 69 jobs could be created as a result of the construction of the Development (for an installed capacity of between 28 – 33 MW and a construction period of 1 year).

The Sustainable Energy Authority of Ireland' 2015 report 'A Macroeconomic Analysis of Onshore Wind Deployment to 2020'[32] puts direct construction jobs from wind farm developments at 1.07 jobs per MW based on 1 year of construction. Using this figure, a projection of between 52 and 62 jobs could be created as a result of the construction of the Development (for an installed capacity between 28 – 33 MW and a construction period of twenty-one months). Therefore, considering the minimum and maximum figures, it is estimated that between 52 and 92 direct and indirect jobs could be created during the construction phase of the proposed project. It is not expected that all of these jobs will be based at the wind farm Site, however, the employment of tradespeople, labourers, and specialised contractors for the construction phase will have a direct, short-term significant, positive impact on employment in the study area.

An estimated breakdown of the potential construction employment is as follows:

Table 4.7: Estimated Employment breakdown during the construction phase of the Development

Occupation/Task	No. of People	Employment Period
Foundation team	eight	20 weeks
Roads (truck drivers)	four	40 weeks
Plant drivers	two	48 weeks
Foreman	one	84weeks
Senior Engineer	one	84 weeks
Junior Engineer	one	15 weeks
Substation Civils	five	24 weeks
Substation electrical	seven	16 weeks
Foreman	one	15 weeks
General operatives	one	84 weeks

[31] European Wind Energy Association (EWEA) (2009), Wind at Work, - Wind Energy and Job Creation in the EU [Accessed Online: 27/06/2022] available at: http://www.ewea.org/fileadmin/files/library/publications/reports/Wind_at_work.pdf

[32] Sustainable Energy Authority Ireland (SEAI) (2015), A Macroeconomic Analysis of Onshore Wind Deployment to 2020. [Accessed Online: 27/06/2022]. Available at: https://www.seai.ie/publications/A-Macroeconomic-Analysis-of-Onshore-Wind-Deployment-to-2020.pdf

A total of 25 persons will be employed on site during the peak of the construction phase of civil engineering of access Roads, crane hardstand, turbine foundation, and substation construction. These numbers will be somewhat less for the turbine delivery, assembly and commissioning activities. A mixture of skills will be required, including unskilled/semi-skilled/skilled manual (construction labour and machine operators), non-manual (administration roles), managerial and technical (civil, electrical, mechanical technical and engineering) and professional roles (scientific, engineering, legal, business and accounting). The manual roles will be Site-based with the other roles being predominately office-based, with Site visits as and when required. During construction, personnel will be at the Site over a number of months and during these times will likely use local accommodation and restaurants and other facilities.

There will be 10 workers required for the decommissioning phase including engineer/ supervisor, crane drivers, plant drivers, banksman, HGV drivers, safety officer, wind turbine technician and general operatives.

Anecdotal evidence received by the Developer on other wind farm construction projects shows that local businesses such as accommodation providers welcome the enhanced level of occupancy that is achieved due to the construction contractors using their accommodation on a year-round basis, including periods of the year that are traditionally considered 'low season'. This is supported by the Edf-re.uk study which found the local benefits from wind farm construction projects included:
"*using local contractors, developing businesses to build wind farm technology, and supporting the workforce with food, accommodation and amenities*"[33]

The benefits of increased business, although temporary, can allow businesses to invest in improvements that would not otherwise be affordable, leading to a long-term enhancement.

Whilst assessment of potential effects on the tourism economy are considered in **Section 4.4.5** to be negligible and not significant, the benefits to individual businesses will be substantial and significantly positive.

The Project will create two full-time jobs during the operational phase. In addition to these jobs, various personnel will be required for the successful and continued operation of the wind farm. During the operation phase of the wind farm, the operation and reliability,

[33] Edf-re.uk [accessed 29/06/2022] available at: https://www.edf-re.uk/local-community/community-benefits#economy

maintenance (turbines, civil works and electrical infrastructure) finance, ongoing compliance with permissions and permits, safety, security, community relations and benefits and land-owner agreements must be continually managed. These requirements are widely distributed over various employment sectors and are an integral part of the ongoing operation of the Project and will provide continuous employment for the lifetime of the wind farm. A general outline of the employment associated with the operational phase of the wind farm is outlined in **Table 4.8.**

Table 4.8: Parties involved during the operational phase[34]

Maintenance Contracts	Financial and Services Contracts	Other Stakeholders
Project Manager	Lenders	Local Community
Asset Management	PPA Provider	Local Authority (incl. rates payments)
Turbine Contractor • Transport Companies • Crane Hire • Plant and Vehicle Hire • Site Facilities	Landowner Agreements	Construction and Maintenance material suppliers: • Local shops • Food providers • Accommodation providers
	Insurance	Plant Hire companies
	Accountancy	Telecom provider
	Safety Consultants	
	Community Liaison Officer	
Electrical Works Contractor	Environmental Monitoring • Noise • Ornithology • Habitat Management	
Civil Works Contractor		
Utility		

The persons fulfilling these roles may live and work anywhere in Ireland, visiting the Site as and when required, to operate and maintain the plant and equipment. During major service operations, personnel may be at the Site over several days and during these times may use local accommodation and restaurants.

Overall, there will be a slight positive short-term impact on employment in the area during construction and decommissioning and a long-term positive impact on employment in the area during the operation phase.

[34] Irish Wind Energy Association (2019) *Life-cycle of an Onshore Wind Farm*. Ionic Consulting. Available online at: https://www.iwea.com/images/files/iwea-onshore-wind-farm-report.pdf [Accessed 13/11/2019]

4.4.4.1 Embedded measures

The Developer has a long track record of developing wind farms in Ireland and experience from previous wind farm construction projects is that expenditure in local goods and services is widely spread and makes a difference to existing businesses. A study by KPMG on behalf of Wind Energy Ireland in 2021 confirms this[35]. The Developer is committed to employing good practice measures with regard to maximising local procurement and will adopt measures such as those set out in the Renewable UK Good Practice Guide, 2014: 'Local Supply Chain Opportunities in Onshore Wind' (Renewable UK, 2014).

The Developer will work with a variety of contractors who will be actively encouraged to develop local supply chains throughout the local area, and work with subcontractors to invest in training and skills development.

At this stage in the development process, it is not possible however, to quantify economic benefits in respect of individual supply chain companies, as contracts would not be offered until consent is granted. However, it is evident from the Developer's recent experience that local and regional suppliers of a wide range of goods and services will benefit from such a Development (in this case, Cork, Kerry and Ireland as a whole).

4.4.5 Land Use

Prior to the grid connection installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions to maintain local access as much as possible and avoid impacts on various land uses.

With reference to **Chapter 8: Soils and Geology,** peat depth across the site is generally very shallow to shallow with the exception of isolated pockets of moderately deep pnorth-west of the site. There was no very deep peat observed at the site. There is a relatively extensive area of deep peat north of proposed location for T1 and the associated access track. The footprint of the proposed development avoids this area. The Risk Ranking at peat probe locations is generally Very Low to Low with the exception of Moderate or High-risk point locations associated with deeper peat and/or steeper inclines and/or close proximity to sensitive receptors. Similarly, the Risk Ranking for Subsoil Stability at trial pit locations is generally Very Low to Low. An Emergency Response Plan has been included in **Appendix 2.1: Construction Environmental Management Plan**.

[35] Economic impact of onshore wind in Ireland, KPMG for Wind Energy Ireland, 2021. [Accessed Online: 29/06/2022] Available at: https://windenergyireland.com/images/files/economic-impact-of-onshore-wind-in-ireland.pdf

4.4.6 Tourism

The impact upon tourism was considered within this section through the sensitivities of Hospitality, Safety and Pace of Life

Fáilte Ireland published guidelines in 2011 for the treatment of tourism in an EIS, which describes the effects of wind farm projects on tourism. Many of the issues covered in the report are similar to those covered in this EIAR, for example, scenery is assessed in **Chapter 12: Landscape and Visual Amenity**.

Fáilte Ireland published a study on 'Visitor Attitudes on the Environment' in 2012[36] to assess the perceived impacts of wind farms on potential future visits to an area. The study found that 12% of those surveyed, responded that wind farms would have 'a strong positive impact' on their decision to visit Ireland, with 27% responding it would have a 'slight positive impact', whilst 38% said it would have 'no impact'. 7% of respondents stated it would have a 'strong negative impact' and 15% stated it would have a 'slight negative impact'. The survey also found that wind farms were noted as more favourable than other forms of development such as housing, mobile phone masts or electricity pylons.

Based on historical examples and findings of the BiGGAR Economics report (mentioned in **Section 4.3.5.3**) there is not expected to be any direct relationship between the tourism sector growth and this Project.

A small section of the grid route (640 m) is located along the Beara to Breifne Way. Works along this section will take up to seven days to complete. Pedestrian access will be maintained during the construction and decommissioning phases and works will be completed outside peak tourist season where possible. Due to the small-scale and temporary nature of the works there will be a short-term, slight, negative impact on tourism during the construction and decommissioning phases.

It is also proposed that waymarking and public information signage will be installed to facilitate the public use of routes in and around the Site once works are complete. The upgrading of existing roads and the development of new roads will allow access to the area for walkers/mountain bikers within the parts of the wind farm site located on Coillte lands. Coillte's Open Forest policy also means walkers will have full access to the forestry and tracks once construction work is complete.

[36] Fáilte Ireland (2012) Visitors Attitudes on the Environment – Wind Farms - https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf [Accessed on 13/11/2019]

Based on the findings of the assessment of tourism in the area and the potential impacts, it was considered that the Project will not give rise to any significant effects on tourism. The overall effects of the Project with regards to tourism for both construction and decommissioning are considered short-term, slight, negative. There will be a long-term, slight positive impact during operation due to the provision of new tracks, information boards and waymarking.

4.4.7 Human Health

4.4.7.1 Electromagnetic fields

Electromagnetic fields from wind farm infrastructure, including the grid connection and substation, are very localised and are considered to be an imperceptible, long-term impact.

4.4.7.2 Shadow flicker

Section 4.6 provides an impact assessment of shadow flicker from the Project.

4.4.7.3 Noise

The construction process associated with wind farms is not considered intensive and is temporary works, most of which is carried out a considerable distance from receptors. The main noise sources will be associated with the construction of the turbine foundations, turbine hardstands, grid connection, extraction and processing in the borrow pit location, with lesser sources being site access roads, construction of a 38 kV substation and compound and works at turbine delivery nodes. Accessing stone material from the borrow pit will significantly reduce road traffic flow on local roads. The main construction traffic to Site will be due to a very short period where trucks will deliver stone around the Site and ready-mix trucks deliver concrete for the turbine bases. The delivery of turbines by large trucks travelling at very low speed will generate very low levels of noise.

The effects of noise and vibration from onsite construction activities are not considered significant. The effects for Decommissioning will be similar to construction but of shorter duration (See Chapter 11, Section 11.4.1).

Predicted operational noise limits from the Project are within the noise limits set out in the Wind Energy Development Guidelines 2006 and are imperceptible. (see **Chapter 11: Noise and Vibration**, Section 11.4.3).

Noise effects during decommissioning of the Project are likely to be of a similar nature to that during construction but of shorter duration. Existing roadways and turbine bases (excluding

plinths) will be left in place and naturally vegetated over. Any legislation, guidance or best practice relevant at the time of decommissioning will be complied with.

4.4.7.4 Air Quality

Chapter 10: Air and Climate provides an assessment of air quality in relation to the Project. The impact assessment concludes that:

The effect of the Project on air quality will be imperceptible over the short-term period in which there will be an increase in traffic movements during construction and decommissioning. There will be slight, long term, positive effects on air quality because of the wind farm during operation.

Overall, the air quality impacts of the Project on Human Health will be a long term, positive effect on human health.

4.4.7.5 Water Contamination

Chapter 9: Hydrology and Hydrogeology provides an assessment of the hydrological impacts of the Project, including the potential for water contamination.

Water contamination could potentially occur during the construction and the decommissioning phases from the release of suspended solids, accidental spillages of cement, hydrocarbons or HDD fluid. Once mitigation measures are implemented the risk of water contamination will be significantly reduced. However, there remains a level of risk and therefore both precautionary measures and emergency response protocols have been established and specified in Management Plans 1 and 3 of the CEMP, **Appendix 2.1**.

4.4.7.6 Traffic

Chapter 15: Traffic and Transportation provides an assessment of the traffic impacts in relation to the Project.

The assessment concludes that: the Project has generally been assessed as having the potential to result in a negative, slight/moderate, direct, short-term, high probability effect during the construction and decommissioning phases and, imperceptible during the operational phase. After mitigation, the residual effects have been assessed as minor to negligible, negative and short-term in nature during the construction phase, imperceptible during the operational stage and slight, negative, direct, high probability and short-term in nature during the decommissioning phase.

It is possible that a blade (or set of blades) could require replacement if damaged by lightning on one of the surrounding operational or planned Wind Farms. Should this coincide with the construction period for the Development, then there is the potential for cumulative transport affects. However, these are considered as being of low probability, slight impact and of short duration.

4.4.8 Property Value

Based on the available published studies the operation of a wind farm at the Site will not significantly impact on property values in the area as discussed in Section 4.3.7. The Project will have a long-term imperceptible impact on property values.

4.4.9 Natural disaster and major accidents

Chapter 16: Major Accidents & Natural Disasters provides an assessment of the vulnerability of the Project to major accidents and natural disasters. Possible risks associated with the Project during the construction, operation and decommissioning phases are outlined and assessed. The consequence ratings assigned to each potential risk assumes that all proposed mitigation measures and safety procedures have failed to prevent the major accident and/or disaster. All scenarios when assessed were considered "low risk".

4.5 MITIGATION MEASURES AND RESIDUAL EFFECTS

Although no negative potential impact of significance has been established, there are a number of measures, which will be implemented for the safety of workers and the public during the construction, operational and decommissioning phases.

4.5.1 Embedded Mitigation

The Project, as described in **Chapter 2: Project Description**, incorporates good practice measures for limiting adverse effects of the construction works. The principal potential effects on human health arising from works tend to relate to construction traffic affecting the use of National roads, local primary roads and access roads by the general public and drainage. Measures are set out in **Chapter 15: Traffic and Transportation** relating to how delivery of goods and services will be managed during works to minimise impacts and details of mitigations and the use of Sustainable Drainage Systems can be found in **Chapter 9: Hydrology and Hydrogeology**. The proposed mitigation measures have been further developed in the **Construction and Environmental Management Plan (CEMP) (Appendix 2.1)**.

4.5.2 Population and Settlement Patterns

Given that no negative impacts have been identified, no mitigation measures are proposed.

4.5.3 Economic Activity

Allowing for the implementation of embedded mitigation (section 4.4.3.1 above), no significant effects have been identified in respect of socio-economic receptors arising from the construction of the Project and therefore no mitigation measures are required to reduce or remedy any adverse effect.

4.5.4 Employment

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

4.5.5 Land Use

Mitigation measures for land use have been incorporated into the preliminary design stage. This has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur.

In this regard, the construction and operational footprint of the Project has been kept to the minimum necessary to avoid impact on existing land uses. Furthermore, existing forestry tracks have been incorporated into the design to minimise the construction of new Site Access Roads and minimise the removal of forested areas. New Site Access Roads have been sensitively designed to minimise impact on forestry. Electricity cables will be installed underground in or alongside Site Access Roads to avoid and minimise negative impact. The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan (CEMP). This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.

Chapter 15: Traffic and Transportation will be referred to for all proposed works and deliveries along the turbine delivery route to avoid undue impact to adjacent land uses.

4.5.6 Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Project, which has allowed for the prevention of unnecessary or inappropriate development to occur that will significantly affect any recreational or tourist amenity. In designing the Project, careful consideration was given to the potential impact on landscape amenity and setback distances from sensitive receptors.

There are no existing walkways or trails located on Site. A section of the grid route (640 m) is located along the Beara to Breifne Way. Pedestrian access will be maintained during the construction and decommissioning phases and works will be completed outside peak tourist season where possible. In providing for public safety, appropriate signage and safety measures will be put in place during construction and decommissioning activities.

4.5.7 Human Health and Safety

4.5.7.1 *Construction and Decommissioning*

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The Development will be designed, constructed, operated and decommissioned in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013 as amended
- Safety, Health & Welfare at Work Act 2005, and
- Safety, Health & Welfare at Work (General Applications) Regulations 2007 as amended

All construction staff will be adequately trained in health and safety and will be informed and aware of potential hazards.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be followed. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The Developer is required to ensure a competent contractor is appointed to carry out the construction works. The Contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.

In relation to COVID-19, up to date Health Service Executive guidance will be consulted regularly in line with Health and Safety Authority recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites, should the virus be prevalent at the time of construction.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be not significant and temporary to short-term.

Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction and decommissioning stage. The construction site will be temporarily closed in sections to the public for the twenty-one-month construction period as well as the decommissioning period. This measure aims to avoid potential injury to members of the public as a result of construction activities.

Appropriate warning signage will be posted at the construction site entrance, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes.

In relation to the turbine delivery route, extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians.

Once mitigation measures and health and safety measures are implemented and followed, the potential for impact on human health for members of the public during construction and decommissioning of the proposed project is expected to be not significant and temporary to short-term.

4.5.7.2 Operation

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

Equipment within high voltage substations presents a potential hazard to health and safety. The proposed substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.

All electrical elements of the Project are designed to ensure compliance with electro-magnetic fields (EMF) standards for human safety.

All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.

Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components. Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throw.

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risk posed to humans is negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts. A Supervisory Control and Data Acquisition ("SCADA") system will monitor the Development's performance. If a fault occurs, then a message is automatically sent to the operations personnel preventing emergency situations. In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

Access to the turbines inner structure will be locked at all times and only accessed by licenced employees for maintenance.

In line with the Health Service Executive's Emergency Planning recommendations, any incident which may occur at the site which requires emergency services, incident information will be provided in the 'ETHANE' format:

- Exact location;
- Type of incident;
- Hazards Access and egress;
- Number of casualties (if any) and condition, and
- Emergency services present and required

4.5.8 Major Accidents and Natural Disasters

The design of the Project has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk due to run off with the use of Sustainable Drainage Systems (SuDS). Construction drainage will be left in-situ for the lifespan of the project through to decommissioning.

The Contractor's fire plans are reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of firefighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker detection systems will be installed on all turbines to manage occurrence of shadow flicker on nearby receptors.

4.5.9 Property Value

Given that potential impacts of the Project at construction, operation and decommissioning phases are a long-term imperceptible impact in respect of property value no mitigation measures are considered necessary.

4.5.10 Residual Risk

Once the above mitigations are taken into account, the residual risk on population and human health is assessed to be an imperceptible, long-term effect.

4.6 CUMULATIVE EFFECTS

For the assessment of cumulative impacts, any other existing, permitted or proposed developments (wind energy or otherwise) have been considered where they have the potential to generate a significant incombination or cumulative impact with the construction and operational phases of this Project. Further information on projects considered as part of the cumulative assessment are given **Chapter 2 Appendix 2.4**. The impacts with the potential to have cumulative impacts on population and human health, in particular noise, air and climate, traffic, material assets and visual impacts are addressed in their relevant chapters of this EIAR.

4.7 SUMMARY OF SIGNIFICANT EFFECTS

The assessment has not identified any likely significant effects from the Project on its own or in combination with other projects on population and human health.

4.8 STATEMENT OF SIGNIFICANCE

This chapter has assessed the significance of potential effects of the Project on population and human health. The Project has been assessed as having the potential to result in effects of a slight positive, long-term impact overall. Through the implementation of mitigation measures, the cumulative effects associated with the Project are predicted to be not significant.

4.9 SHADOW FLICKER

This section comprehensively assesses the potential shadow flicker effects of all scenarios within the Turbine Range. The potential impacts that could arise from the Project during the construction, operation and decommissioning phases relate to potential shadow flicker impacts during operation. No shadow flicker will occur during the construction or decommissioning phases.

A shadow flicker computer model was used to calculate the occurrence of shadow flicker at all relevant receptors to the Project. The output from the calculations is analysed to identify and assess potential shadow flicker impacts. This is further detailed in **Appendix 4.1a** to **d**. Where negative effects are predicted, this section identifies appropriate mitigation strategies.

The 2018 Review of the 2006 Wind Energy Development Guidelines confirms that:
"Shadow Flicker occurs when the sun is low in the sky and the rotating blades of a wind turbine casts a moving shadow which, if it passes over a window in a nearby house or other property results in a rapid change or flicker in the incoming sunlight. The time period in which a neighbouring property may be affected by shadow flicker is completely predictable."

Shadow flicker lasts only for a short period and happens only in certain specific combined circumstances. The circumstances require that:

- the sun is shining;
- the turbine is directly between the sun and the affected property, and
- there is enough wind energy to ensure that the turbine blades are moving.

If any one of these conditions is absent, shadow flicker cannot occur.

The 2019 Draft Revision of the Wind Energy Development Guidelines (WEDG) also added the following circumstance required for shadow flicker occurrence:

- *"there is sufficient direct sunlight to cause shadows (cloud, mist, fog or air pollution could limit solar energy levels)"*

The 2019 Draft Guidelines also note:

"Generally only properties within 130 degrees either side of north, relative to the turbines, can be affected at these latitudes in the UK and Ireland – turbines do not cast long shadows on their southern side".

Shadow flicker may have the potential to cause disturbance and annoyance to residents if it affects occupied rooms of a house. Careful site selection, design and planning, and good use of relevant software to control turbine operation can help reduce the possibility of shadow flicker. Modern wind turbines have the facility to measure sunlight levels and to reduce or stop turbine rotation if the conditions that would lead to excess shadow flicker at any neighbouring property arise.

The distance and direction between the turbine and property is of significance because:

- The duration of the shadow will be shorter, the greater the distance (i.e., it will pass by quicker)
- The shadow flicker cast by rotating wind turbine blades will be reduced, the further a dwelling is from an operating turbine

The path of the sun varies over the seasons resulting in a changing potential for a shadow to be cast throughout the year. Similarly, the sun's position in the sky over the course of a day is changing such that the shadow cast by a turbine is constantly changing. Shadow flicker is more likely to occur on sunny winter days, when the sun is lower in the sky and shadows can cast a greater distance from the turbine. Shadow flicker is more likely to occur to the west or south-west of the wind turbines with some occurrences also predicted to the north or north-east and south-east. This can be seen in **Appendix 4.1 a** to **d**.

Persons with photosensitive epilepsy can be sensitive to flickering light between 3 and 60 Hertz (Hz)[37]. This is supported by research in recent years asserting that flicker from turbines must interrupt or reflect sunlight at frequencies greater than 3 Hz to pose a potential risk of inducing photosensitive seizures. The frequencies of flicker caused by modern wind turbines are less than 1 Hz[38], and are well below the frequencies known to trigger effects in these individuals. Therefore, any potential shadow flicker effect from the wind turbines is considered an effect on residential amenity, rather than having the potential to affect the health of residents.

[37] Epilepsy Action (2012) *Other Possible Triggers of Photosensitive Epilepsy*. Available online at: http://www.epilepsy.org.uk/info/photosensitive-epilepsy [Accessed on 27 November 2019]
[38] Harding, G., Harding, P., & Wilkins, A. (2008). *Wind turbines, flicker, and photosensitive epilepsy*. *Epilepsia* (49) 6, pp. 1095-1098.

4.9.1.1 Relevant Guidance

The relevant Irish guidance for shadow flicker is derived from the 'Wind Energy Development Guidelines for Planning Authorities' (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012).

The Department of Environment, Community and Local Government in its Wind Energy Development Guidelines (2006) (the 2006 Guidelines) considers that:
"At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times".

The 2006 Guidelines also state that:
"It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day".

A significant minimum separation distance from all occupied dwellings of 740 m has been achieved with the Project design. There are 7 No. occupied dwellings within 1 km of any proposed wind turbine location.

Although the DoEHLG thresholds apply to dwellings located within 500 metres of a proposed turbine location, for the purposes of this assessment, the guideline thresholds of 30 hours per year or 30 minutes per day have been applied to all properties located within ten rotor diameters (i.e., assumed at 1,550 metres as the widest potential rotor diameter within the range (155 m) and 2,000 metres for completeness) of the proposed turbines (as per IWEA guidelines, 2012). The DoEHLG Guidelines state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low.

The adopted 2006 DoEHLG guidelines are currently under review. The DoHPLG released the 'Draft Revised Wind Energy Development Guidelines' in December 2019. The revised draft of Wind Energy Development Guidelines 2019 provides for zero shadow flicker.

The Draft 2019 Guidelines are based on the recommendations set out in the 'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review' (December 2013) and the 'Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach' (June 2017).

The assessment herein is based on compliance with the current DoEHLG Guidelines limit (30 hours per year or 30 minutes per day). However, it should also be noted that the Project can be brought in line with the requirements of the 2019 draft guidelines to ensure no shadow flicker occurs at residential dwellings within the vicinity of the wind farm. Should the 2019 draft guidelines be adopted while this application is in the planning system, the Project will fully comply with their requirements through the implementation of the mitigation measures outlined herein and subject to a time allowance for the turbine to safely stop rotating.

4.9.1.2 Shadow Flicker Modelling

An industry standard wind farm assessment software package, WindPRO from EMD International Version 3.6 was used to prepare a model of the proposed wind turbines. The programme facilitates the analysis of a wind farm for possible shadow flicker occurrence at nearby houses. It allows for the production of maps, and shadow flicker prediction. The data output from the programme has been analysed and the receptors potentially vulnerable to shadow flicker were identified. The significance of shadow flicker effects was then assessed.

Generic windows of 2 m width, 2 m height and 0.5 m from bottom line above ground are applied in the model to each side of the house. The model assumes the receptor will not face any particular direction, but instead will face all directions. These windows represent an approximation of the existing windows on the houses facing north, south, east and west and provide an estimate of potential shadow flicker to a window on each side of the house. The software determines the times of day/year when the sun will be in line with the rotational components of the turbine and the house/receptor, thereby having the potential to cause shadow flicker. The software outputs details of potential shadow flicker, in this case by mean and maximum duration of the shadow flicker events, days per year and times of occurrence and maximum hours per year and maximum minutes per day of shadow flicker.

The following data inputs were required and used to produce an estimate of the effect of shadow flicker from the wind farm:

- Digital elevation model of the Study Area (10 m resolution – OS X, Y, and Z data points);
- Turbine locations;
- Turbine dimensions (rotor diameter and hub height);
- Receptor locations (i.e., property locations);
- Bottom line height above ground 'window' (0.5 m above ground level),and
- Wind speed and direction for the site to determine the period that the wind turbines will be in operation from the different wind directions during the year.

The software creates a mathematical model of the proposed wind turbines and their surroundings and uses this information to calculate specific theoretical times and durations of flicker effects for the identified properties. The following 'worst-case' assumptions were initially incorporated into the shadow flicker modelling:

- there are no clouds and sunlight is always bright and direct;
- the turbines are always rotating whereas this might not be the case due to maintenance works or break downs;
- there is no intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect,
- a limit to human perception of shadow flicker is not considered by the model.

The model operates by simulating the path of the sun during the year. The results of the model provide a calculation of theoretical specific times and durations of flicker effects for the identified properties. As previously stated, given the assumptions incorporated into the model, the calculations overestimate the duration of effects. The worst-case assumption is considered to be sufficient for the purposes of this assessment as it assumes the sky is always clear, the turbines are always aligned face-on to each window and that there is a clear and undisturbed line of sight between the windows of the receptors and the turbines (except where this is prevented due to topography). In reality, this will not occur; the turbines will not always be orientated as described, clouds will obscure the sun and line of sight may also be obscured (for example, from leaves on trees). The flicker effects will be substantially less than this and will not meet the results of the worst-case assumption.

The model also outputs a more realistic scenario, or "expected values". In this scenario, the only change in assumptions is that the statistically likely monthly sunshine frequency and wind direction frequency data is assessed. This assessment only changes the annual hours per year metric and is not applied to the daily data. The data used in the model was the:

- Long-term sunshine probability data from the Met Éireann synoptic station in Valentia
- Long-term wind rose data for the onsite met mast

4.9.1.3 Baseline Description

The study area is defined as ten times the widest potential rotor diameter within the range (10 x 155 m = 1,550 m). A range of turbine parameters were assessed; however, a maximum rotor diameter of 155 m was used to calculate this distance which was then rounded up to 2 km. This dimension gives the most significant outcome as smaller rotor diameters will cast less shadow. A study area of 2,000 m is used for completeness.

In determining potential shadow flicker effects, it is the swept path of the blade that dictates the shadow. The longer the blade the greater the swept path and corresponding shadow, the shorter the blade the smaller the swept path and shadow. A specimen turbine and three alternative scenarios were included in the assessment in order to fully assess the range of turbine parameters discussed in **Chapter 2: Project Description**. A specimen turbine was selected to model a base case scenario using the maximum possible rotor diameter and tip height. To ensure the full extent of the moving shadow which would be created by the Turbine Range was assessed the following scenarios were modelled.

- Specimen Turbine – 107. 5 m hub, 155 m rotor diameter (longest rotor), 185 m tip height
- Alternative Scenario 1 – 102.5 m hub (lowest hub), 155 m rotor diameter (longest rotor), 180 m tip height
- Alternative Scenario 2 – 110.5 m hub (tallest hub), 149 m rotor diameter (shortest rotor), 185 m tip height
- Alternative Scenario 3 – 102.5 m hub (lowest hub), 149 m rotor diameter (shortest rotor), 177 m tip height

A shadow flicker computer model was used to calculate the occurrence of shadow flicker at relevant receptors (houses located within 1,550 m of the proposed turbines). The output from the calculations is analysed to identify and assess potential shadow flicker impacts. Wind turbines, like other tall structures, can cast long shadows when the sun is low in the sky.

The properties were identified using a combination of Ordnance Survey of Ireland (OSI) Maps, AutoCAD drawings and from internet mapping resources including *Eircode Finder, Google Street View*, *Google Earth*, *Bing Maps,* a planning permission search using the Cork and Kerry County Council web resources and from a number of visits to the Study Area. There are 39 properties within the shadow flicker study area radius. The majority of houses are located to the east, north and south of the Development. The coordinates of each dwelling and its distance to the closest proposed turbine are listed in **Table 4.9** and are shown in **Figure 1.3**.

Table 4.9: Properties within the shadow flicker study area

House ID	Easting ITM	Northing ITM	Elevation (AOD m)	Closest Turbine	Distance to Closest Turbine (m)
H1	512160	578211	346.3	T2	755
H2	513445	578031	285.9	T2	764
H3	513072	579801	338.1	T3	767

House ID	Easting ITM	Northing ITM	Elevation (AOD m)	Closest Turbine	Distance to Closest Turbine (m)
H4	514329	579384	289.3	T4	790
H5	514339	577982	318.8	T5	808
H6	514756	578856	262.2	T5	825
H7	513435	577744	264.0	T2	965
H8	512511	577570	263.5	T2	1004
H9	513762	577696	259.3	T5	1010
H10	513449	577603	249.4	T2	1089
H11	513566	577655	253.1	T5	1102
H12	514700	579510	276.8	T5	1114
H13	513505	577609	248.6	T2	1116
H14	513565	577612	248.9	T5	1143
H15	512009	577691	278.3	T2	1178
H16	513794	577514	246.6	T5	1185
H17	511756	577894	314.3	T1	1206
H18	511689	577885	311.8	T1	1249
H19	513838	580300	300.4	T4	1270
H20	513548	577431	232.8	T2	1287
H21	514950	577873	283.9	T5	1292
H22	515053	579406	282.1	T5	1318
H23	513747	577308	221.7	T5	1395
H24	514759	577513	272.4	T5	1429
H25	513572	577269	216.5	T2	1438
H26	513974	577197	219.1	T5	1493
H27	515322	579275	275	T5	1494
H28	513631	577179	207.2	T5	1543
H29	515488	579130	260.2	T5	1602
H30	514568	577209	245.3	T5	1605
H31	514413	577149	233.8	T5	1608
H32	511831	577246	253.3	T2	1628
H33	515603	579094	254.1	T5	1704
H34	512444	580689	261.7	T3	1731
H35	515614	578103	249.3	T5	1767
H36	515672	578122	245.8	T5	1815
H37	515646	578046	243.3	T5	1816
H38	515525	579630	278.7	T5	1837
H39	515332	577403	242.0	T5	1890

4.9.1.4 Assessment of Potential Effects

This assessment considers the potential shadow flicker impact of the Development on the remaining surrounding properties in terms of:

- Predicting and assessing the extent of shadow flicker experienced by all properties within the shadow flicker study area
- Specifying mitigation measures, where deemed necessary

A detailed assessment of each of the following scenarios is included in **Appendix 4.1a**, **4.1b**, **4.1c** and **4.1d**:

- Specimen Turbine – 107.5 m hub, 155 m rotor diameter, 185 m tip height
- Alternative Scenario 1 – 102.5 m hub, 155 m rotor diameter, 180 m tip height
- Alternative Scenario 2 – 110.5 m hub, 149 m rotor diameter, 185 m tip height
- Alternative Scenario 3 – 102.5 m hub (lowest hub), 149 m rotor, 177 m tip height

Table 4.10: Summary Shadow Flicker Listing for All Properties

	Specimen Turbine			Alternative Scenario 1			Alternative Scenario 2			Alternative Scenario 3		
Receptor ID	Worst Case Shadow [h/year]	Expected Shadow [h/year]	Max Shadow [h/day]	Worst Case Shadow [h/year]	Expected Shadow [h/year]	Max Shadow [h/day]	Worst Case Shadow [h/year]	Expected Shadow [h/year]	Max Shadow [h/day]	Worst Case Shadow [h/year]	Expected Shadow [h/year]	Max Shadow [h/day]
H1	93:18:00	18:06	01:13	94:17:00	18:19	01:12	88:32:00	17:08	01:12	90:23:00	17:32	01:11
H2	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H3	121:06:00	11:51	01:42	118:24:00	11:31	01:42	114:36:00	11:14	01:37	110:08:00	10:43	01:35
H4	98:51:00	11:24	00:48	98:24:00	11:18	00:48	92:49:00	10:42	00:46	92:31:00	10:35	00:46
H5	21:15	04:41	00:24	11:50	02:38	00:24	19:54	04:24	00:23	19:23	04:17	00:23
H6	49:31:00	09:56	00:42	49:40:00	09:56	00:42	45:52:00	09:13	00:41	45:44:00	09:07	00:41
H7	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H8	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H9	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H10	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H11	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H12	52:06:00	06:28	00:50	52:10:00	06:22	00:47	47:39:00	05:57	00:48	49:03:00	06:02	00:48
H13	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H14	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H15	12:33	02:25	00:18	00:00	00:00	00:00	11:39	02:15	00:17	10:57	02:07	00:17
H16	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H17	36:13:00	06:50	00:40	25:43:00	04:48	00:31	34:23:00	06:29	00:40	35:23:00	06:40	00:39
H18	40:24:00	07:40	00:41	28:30:00	05:22	00:30	38:32:00	07:18	00:40	39:06:00	07:25	00:39
H19	27:12:00	02:28	00:26	17:20	01:28	00:26	25:43:00	02:19	00:25	24:37:00	02:13	00:24
H20	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H21	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H22	32:34:00	04:47	00:37	24:26:00	03:30	00:28	30:12:00	04:27	00:36	30:21:00	04:27	00:36
H23	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H24	10:35	02:16	00:18	00:00	00:00	00:00	09:51	02:07	00:17	09:33	02:04	00:18
H25	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H26	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H27	18:54	03:01	00:27	17:24	02:44	00:25	17:43	02:49	00:26	17:40	02:49	00:26
H28	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H29	14:29	02:27	00:22	14:31	02:26	00:22	13:26	02:16	00:21	13:26	02:15	00:22
H30	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H31	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H32	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
H33	12:46	02:12	00:21	12:52	02:13	00:22	11:55	02:04	00:21	11:58	02:04	00:20
H34	10:36	00:58	00:19	00:00	00:00	00:00	10:14	00:56	00:19	09:11	00:50	00:18
H35	10:28	02:19	00:21	10:22	02:18	00:21	09:45	02:10	00:21	09:30	02:06	00:21
H36	09:24	02:05	00:21	09:21	02:04	00:21	08:47	01:57	00:20	08:38	01:55	00:20
H37	10:31	02:19	00:21	10:24	02:18	00:21	09:53	02:11	00:20	09:36	02:07	00:20
H38	13:21	01:52	00:20	13:23	01:52	00:20	12:16	01:43	00:19	12:28	01:45	00:20
H39	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00

Annual Impacts - Worst-Case Shadow Flicker

The calculated worst-case shadow flicker occurrences in the **Table 4.10** assumes the sun is always shining, that there is no cloud cover and the dwelling is always occupied and orientated towards the sun and has a window orientated towards the proposed turbines. As previously stated, this calculation is based on topography alone and excludes vegetation, buildings and other man-made structures in the intervening distance. It does not account for weather conditions, which have a significant impact upon the amount of shadow flicker that may actually occur.

It can be seen from **Table 4.10**, that in the case of the Specimen Turbine where a hub height of 107.5 m and a rotor diameter of 155 m are used for the proposed turbines, there will be 20 No. out of 39 No. receptors that will experience some degree of shadow flicker and 19 No. receptors that will experience no shadow flicker. There will be eight (8 No.) receptors that exceed the WEDG (2006) 30 hours per year shadow flicker using the worst-case assumptions of the model.

In Alternative Scenario 1, where a hub height of 102.5 m and a rotor diameter of 155 m are proposed, there will be 17 No. out of 39 No. receptors that will experience some degree of shadow flicker and 22 No. receptors that will experience no shadow flicker. There will be five (5 No.) receptors that exceed the WEDG (2006) 30 hours per year shadow flicker using the worst-case assumptions of the model.

In Alternative Scenario 2, where a hub height of 110.5 m and a rotor diameter of 149 m are proposed, there will be 20 No. out of 39 No. receptors that will experience some degree of shadow flicker and 19 No. receptors that will experience no shadow flicker. There will be eight (8 No.) receptors that exceed the WEDG (2006) 30 hours per year shadow flicker using the worst-case assumptions of the model.

In Alternative Scenario 3, where a hub height of 102.5 m and a rotor diameter of 149 m are proposed, there will be 20 No. out of 39 No. receptors that will experience some degree of shadow flicker and 19 No. receptors that will experience no shadow flicker. There will be eight (8 No.) receptors that exceed the WEDG (2006) 30 hours per year shadow flicker using the worst-case assumptions of the model.

It is possible for wind turbines to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more turbine simultaneously. As can be seen in the shadow flicker assessment attached as **Appendix 4.1** all of the proposed turbines give rise to some degree of cumulative shadow flicker, if unmitigated.

No shadow flicker is experienced at 19 No. dwellings in all scenarios assessed (**Table 4.10**). At these locations, the suns angle (or azimuth) relative to the turbines and receptors never reaches the required position for shadow flicker effects to occur in these areas. Therefore, these are ruled out for further assessment.

Annual Impacts – Expected Shadow Flicker

To calculate more realistic and 'real world' occurrences of shadow flicker for the receptors that are identified as potentially vulnerable to shadow flicker (**Table 4.10**), it is necessary to identify the likely meteorological conditions which are expected to be experienced at the Site. To estimate the likely duration of sunshine occurrence at the Site, historical meteorological data from the Met Éireann is automatically uploaded by the software. Data from Valentia Meteorological Observatory was used as this Met Éireann observatory is the closest to the Site. This gives a good representation of data for the Development. This data was utilised to consider the probability of sunshine occurrence, and thus allow the determination of 'projected' values for shadow flicker occurrence.

The worst-case predicted hours for shadow flicker are reduced by the average time the weather is cloudy annually. As discussed above, to estimate the impact of sunshine occurrence, historical meteorological data is utilised to consider the likelihood of sunshine (the sunshine probability) at different times of the year. This allows the determination of 'expected' values for shadow flicker occurrence as can be seen in the 'Expected' columns in **Table 4.10**. This is achieved by applying a reductive factor to the worst-case total hours per year of shadow flicker. **Table 4.10** shows the worst-case and the expected shadow flicker values per year which are likely to be experienced by each receptor. Although the expected duration of shadow flicker is reduced substantially for each dwelling when data from Valentia Meteorological Observatory is incorporated into the assessment, they are not eliminated entirely for all the 39 No. receptors within the shadow flicker study area of the Development.

For the specimen turbine scenario there are no exceedances of the WEDG (2006) shadow flicker 30hrs/year threshold at any receptor using the expected shadow flicker data. H1 has the greatest shadow flicker impact at 18hours and 6minutes per year.

In Alternative Scenario 1 there are no exceedances of the WEDG (2006) shadow flicker 30hrs/year threshold at any receptor using the expected shadow flicker data. H1 has the greatest shadow flicker impact at 18hours and 19minutes per year.

In Alternative Scenario 2 there are no exceedances of the WEDG (2006) shadow flicker 30hrs/year threshold at any receptor using the expected shadow flicker data. H1 has the greatest shadow flicker impact at 17hours and 8minutes per year.

In Alternative Scenario 3 there are no exceedances of the WEDG (2006) shadow flicker 30hrs/year threshold at any receptor using the expected shadow flicker data. H1 has the greatest shadow flicker impact at 17hours and 32minutes per year.

Daily Shadow Flicker Impacts

It is not appropriate to apply the annual average sunshine hours correction to the predicted daily totals as the data is based upon monthly averages, which cannot be applied to daily levels with sufficient accuracy. Furthermore, the infrequency of clear skies is more likely to reduce the overall number of instances of shadow flicker over the year, rather than reduce the length of each individual instance. As such, the assessment of daily impacts considers the maximum theoretical amount of shadow flicker only and is inherently conservative.

It can be seen from **Table 4.10**, that in the case of the Specimen Turbine eight receptors will exceed the WEDG (2006) 30 mins per day shadow flicker threshold.

In Alternative Scenario 1, six receptors will exceed the WEDG (2006) 30 mins per day shadow flicker threshold.

In Alternative Scenario 2, eight receptors will exceed the WEDG (2006) 30 mins per day shadow flicker threshold.

In Alternative Scenario 3, eight. receptors will exceed the WEDG (2006) 30 mins per day shadow flicker threshold.

4.9.1.5 Cumulative Effects

Cumulative shadow flicker impacts arise if dwellings are at risk from potential shadow flicker impacts as a result of more than one wind farm. While separate wind farms are not likely to cause effects simultaneously, they could increase the cumulative total hours where a receptor is impacted. In this instance, there is no project listed in **Chapter 2** which includes proposed, consented or existing wind farms within a 2 km range of the turbines that may cause cumulative effects.

4.9.1.6 Mitigation Measures & Residual Effects

Due to the potential for shadow flicker to affect receptors within the shadow flicker study area, it is proposed that a shadow control system will be installed on each of the wind turbines. The control system will calculate, in real-time:

- Whether shadow flicker has the potential to affect nearby properties, based on pre-programmed co-ordinates for the properties and turbines;
- Wind speed (can affect how fast the turbine will turn and how quickly the flicker will occur);
- Wind direction;
- The intensity of the sunlight, and
- The turbine will automatically shut down safely during periods when shadow flicker exceeds the thresholds as set out in the WEDG (2006); and will restart when the potential for shadow flicker ceases at the affected properties.

The WEDG (2006) recommends a 30 hours per year threshold for shadow flicker. The Draft Revised Wind Energy Development Guidelines, December 2019, recommend that shadow flicker should not impact any dwelling, meaning the relevant turbine or turbines must be shut down on a temporary basis until the potential for shadow flicker ceases.

It is intended that the measures outlined above, subject to safe shut down time of approximately 60 seconds, will ensure the WEDG (2006) shadow flicker thresholds are not exceeded at any of the properties within the study area, this will be the case regardless of which turbine is selected within the turbine range.

The control system can be adjusted to automatically shut-down the turbine when the control systems detects the sunlight is strong enough to cast a shadow thereby complying with the 2019 Draft WEDG if/when they come into effect.

In the event that complaints of shadow flicker are received by the Developer / Site Operator or by Cork County Council during operation, an investigation will take place and the complaints frequency, duration and time of complaints will be considered and specialist modelling software will be used to confirm the occurrence(s). If the effects are confirmed in the modelling, a shadow flicker survey involving the collection of light data will also be carried out at the property in which the complaint was made. Further refinement of the blade shadow control system will be conducted to eliminate the shadow flicker occurrence. This could result in the shutting off turbines at specific times of day.

4.9.1.7 Summary of Significant Effects

This assessment has identified the potential for shadow flicker to affect 20 No. out of 39 No. receptors within the shadow flicker study area for all four scenarios assessed. The expected shadow flicker results show there are no exceedances of the WEDG (2006) 30 hrs/year shadow flicker threshold at these 20 No. receptors. However, the WEDG (2006) 30 mins/day shadow flicker threshold is exceeded at up to eight (8 No.) receptors. A shadow control system will be installed to ensure shadow flicker levels do not exceed the WEDG (2006) thresholds and can be adjusted to eliminate shadow flicker, ensuring compliance with the 2019 Draft WEDG if they come into effect. Such systems are common in many wind farm developments and the technology has been well established.

4.9.1.8 Statement of Significance

This assessment has identified that the Project will comply with the WEDG (2006) shadow flicker guidelines. The assessment also determined that the Project will comply with the 2019 Draft WEDG by installing a blade shadow control system on the proposed turbines. Therefore, the Project will not result in significant impacts in relation to shadow flicker. Given that only effects of significant impact or greater are considered "significant" in terms of the EIA Regulations, the potential effects of the Development as a result of shadow flicker, when mitigated, are considered to be not significant.