Oriel Wind Farm Project
Environmental Impact Assessment Report
Volume 1
Non-Technical Summary

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

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A TETRA TECH COMPANY

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Energy for generations

ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report
Non-Technical Summary (NTS)

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Glossary

Term	Meaning
Applicant	Oriel Windfarm Limited
Bathymetry	The measurement of the depth of water in oceans, seas and lakes.
Catchment	An area of land contributing to a river, lake or other water body.
Foreshore	The area of the land and seabed between the high-water mark of ordinary or medium tides and the 12 nautical mile limit.
Habitat	The natural home or environment of an animal, plant, or other organism.
Horizontal Directional Drilling (HDD)	A method of installing underground cables via directional drilling that does not require digging trenches
Inter array cables	Cables which connect the wind turbines to each other and to the offshore substation.
Intertidal	An area of a seashore that is covered at high tide and uncovered at low tide.
Joint Bay	These are concrete lined chambers, that provide a clean and dry environment for jointing the sections of underground cables together. Link boxes and communication chambers will also be required along the onshore cable route adjacent to each joint bay.
Landfall	The area in which the offshore export cable makes landfall. It is the transitional area between the offshore cable and the onshore cables. The landfall is proposed 700 m south of Dunany Point.
Magnitude	Size, extent and duration of an impact.
Measures included in the Project	The Project design includes a number of designed-in measures and management measures (or controls) which are committed to be delivered by the Applicant as part of the Project. These measures are standard measures applied to offshore wind development, including lighting and marking of the Project, use of 'soft-starts' for piling operations etc, to reduce the potential for impacts. These measures are integrated into the description of the development and have therefore been considered in the assessments in the EIAR.
Metocean	Metocean conditions refer to meteorological and physical oceanographic (e.g. tides and waves) conditions.
Mitigation measure	Measure which would avoid, reduce, or remediate an impact.
Monopile	The cylindrical foundations in the seafloor used to support the wind turbines and OSS.
Onshore cables	Cables that transfer power from the Transition Joint Bay to the onshore substation. The onshore cables will be installed within a single trench of approximately 1 m in width, along an onshore cable route that connects the TJB to the substation site at Stickillin, east of Ardee on the N33.
Offshore cable (or export cable)	The offshore cable (or export cable) will be installed in the offshore cable corridor. This cable will connect the offshore wind farm with the onshore cables at the landfall.
Offshore cable corridor	The corridor between the offshore wind farm area and the landfall in which the offshore export cable will be located.
Onshore cable route	The route of the proposed underground electrical cables between the proposed landfall site and the proposed onshore substation site.
Offshore Substation (OSS)	An offshore substation is a pre-fabricated offshore structure housing electrical equipment to provide a range of functions, such as changing the voltage.
Offshore wind farm area	This area contains the wind turbines (and foundations), inter-array cables, the offshore substation and part of the offshore export cable.
Onshore substation	A site containing the equipment required to filter, monitor and control electricity received from the offshore wind farm and transmit it to the existing electricity Transmission System (National Grid). This includes gas insulated switchgear (GIS) located inside a building; and outdoor air insulated switchgear (AIS).
Ornithology	Ornithology is a branch of zoology that concerns the study of birds.
Passing bay	Temporary passing bays will be installed adjacent to joint bays to enable through traffic during the construction of the onshore cable.
Project design parameters	These are the design details and measurements of the Project infrastructure that are used to inform the assessment of the likely significant effects of the Project on the environment. These also include details on the Project construction, operation and

Term	Meaning
	maintenance and decommissioning phase activities. Where design flexibility applies under Section 287B of the Planning and Development Act 2000 as amended, the project design parameters include a description of the parameters or options e.g. the wind turbine hub height will vary within the range 145-152 metres above Lowest Astronomical Tide (maLAT).
Project	The Oriel Wind Farm Project. The Project includes the construction, operation and maintenance, and decommissioning of offshore and onshore infrastructure.
Residual effect	The degree of environmental change that will occur after the proposed mitigation measures have taken effect (EU, 2017).
Sensitivity	Vulnerability of a sensitive receptor to change.
Scour protection	A solution for preventing scour around subsea structures, typically comprised of rock or concrete mattresses.
Subtidal	Area extending seaward of low tide to the edge of the continental shelf.
Transition joint bay (TJB)	An underground chamber located close to the landfall and above the HWM that connects the offshore export cable to the onshore export cables.
Wind Turbine Generator (WTG)	All of the components of a wind turbine, including the tower, nacelle, blades and rotor.
Zone of Influence (ZoI)	The ZoI (or 'spatial extent of the impact' as described in Annex III(3) of the EIA Directive) is the area which may be subject to significant impacts as a result of the proposed development and associated activities.
Zone of Theoretical Visibility (ZTV)	A mapped visualisation of the areas over which a development could theoretically be seen, based on a Digital Terrain Model (DTM). The ZTV presents a 'bare earth' scenario (i.e. a landscape without screening structures or vegetation) (NatureScot, 2012).

Acronyms

Term	Meaning
ABP	An Bord Pleanála
AEP	Annual Exceedance Probability
AEZ	Archaeological Exclusion Zone
ADD	Acoustic Deterrent Device
AMP	Archaeological Management Plan
AIS	Air Insulated Switchgear
CAP	Climate Action Plan
CD	Chart Datum
CDP	County Development Plan
CEMP	Construction Environmental Management Plan
CTMP	Construction Traffic Management Plan
CGS	County Geological Site
CIA	Cumulative Impact Assessment
CIL	Commissioner of Irish Lights
CTMP	Construction Traffic Management Plan
CTV	Crew Transfer Vessel
DHLGH	Department of Housing, Local Government and Heritage
EEZ	Exclusive Economic Zone
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ERCoP	Emergency Response Co-operation Plan
EU	European Union
FMMS	Fisheries Management and Mitigation Strategy
FTE	Full Time Equivalent
GHG	Greenhouse Gas
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HSA	Health and Safety Authority
HVAC	High Voltage Alternating Current
HWM	High Water Mark
IAA	Irish Aviation Authority
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICES	International Council for the Exploration of the Sea
IEMA	Institute of Environmental Management and Assessment
INIS	Invasive Non-Indigenous Species
IRCG	Irish Coast Guard
JUV	Jack-Up Vessel
LAT	Lowest Astronomical Tide
LCA	Landscape Character Area
LCC	Louth County Council
LMP	Lighting and Marking Plan
LWM	Low Water Mark

Term	Meaning
MAC	Maritime Area Consent
MINNSMP	Marine Invasive Non-Native Species Management Plan
MMMP	Marine Megafauna Mitigation Plan
MPCP	Marine Pollution Contingency Plan
MRFS	Mid-Range Future Scenario
MSO	Marine Survey Office
NDP	National Development Plan
NEET	Not in Education, Employment or Training
NI	Northern Ireland
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement
NISA	North Irish Sea Array
NPWS	National Parks and Wildlife Service
NPF	National Planning Framework
NSL	Noise Sensitive Locations
NTS	Non-Technical Summary
ORE	Offshore Renewable Energy
OREDP	Offshore Renewable Energy Development Plan
OSS	Offshore Substation
pNHA	Proposed Natural Heritage Area
RPS	Record of Protected Structures
RSES	Regional Spatial and Economic Strategy
SAC	Special Area of Conservation
SCI	Site of Community Importance
SF_6	Sulphur Hexafluoride (This is an insulating gas used in gas insulated switchgear)
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPA	Special Protection Area
TAO	Transmission Asset Owner
TJB	Transition Joint Bay
TSO	Transmission System Operator
UKHO	UK Hydrographic Office
UNECE	United Nations Economic Commission for Europe
WFD	Water Framework Directive
WTG	Wind Turbine Generators
ZTV	Zone of Theoretical Visibility

Units

Term	Meaning
GW	Gigawatt
km	Kilometre
km^2	Square kilometre
kV	Kilovolt
m	Metre
m^2	Square metre
mm	Millimetre
MW	Megawatt

1 INTRODUCTION

The Oriel Wind Farm Project (hereafter referred to as "the Project") is a proposed offshore wind farm in the Irish Sea, off the coast of County Louth (approximately 22 km east of Dundalk town centre and 18 km east of Blackrock). Oriel Windfarm Ltd (hereafter referred to as "the Applicant") is proposing to develop the Project. The Project will provide 375 MW of renewable generation capacity.

An Environmental Impact Assessment Report (EIAR) for the Project has been prepared to support an application for permission to construct and operate the Project under the Planning and Development Act 2000, as amended.

This document is a Non-Technical Summary (NTS) of the EIAR. This NTS, which forms volume 1 of the EIAR is a stand-alone document and presents a non-technical summary of the information provided in each chapter of the EIAR including an overview of the environmental effects of the Project.

The EIAR includes 32 chapters and associated technical appendices and is included in volume 2. More detailed information is provided in volume 2, which is divided into volumes 2A, 2B and 2C.

1.1 The Applicant

The company applying for development consent for the Project is Oriel Windfarm Limited. The Project and Oriel Windfarm Limited is a joint venture by Parkwind N.V., ESB and Oriel Windfarm Ltd shareholders – with Parkwind N.V. as the controlling shareholder.

Parkwind N.V. was established in 2012 as a full life-cycle business that develops, finances and operates offshore wind farms. Parkwind currently has 771 MW under operational management spread across four wind farms in the North Sea and 577 MW under development; it has steadily become one of Europe's leading independent offshore industry companies. Parkwind has recently constructed a fifth wind farm in the German Baltic Sea. The Arcadis Ost project is a 257 MW wind farm located north-east of the island of Rügen, Germany.

The partnering developer, ESB, is Ireland's leading electricity utility which was established in 1927. The Irish Government are the majority shareholders of ESB. As the national electricity provider, ESB invest in wind farm energy in order to deliver long-term social, economic and environmental benefits for the state.

Since the 1980s, ESB have been involved in the development and construction of wind farms in Ireland and the UK, through to their operations and maintenance. Launched in 2023, *Networks for Net Zero Strategy* outlines ESB's commitment to futureproofing Ireland's electricity network and making the country's goal of net zero by 2050 a reality. ESB plan to deliver a fivefold increase in their renewable generation portfolio to 5,000 MW by 2040.

1.2 Project background

The inception of the Project occurred in 2001 followed by a period of site selection, project design and environmental assessment resulting in a Foreshore Lease application in 2007. A conditional lease offer was subsequently issued in 2010. A subsequent reform of the legislation under which offshore wind farms, and other projects with a maritime theme, were considered in Ireland has occurred in the intervening years. On this basis the Applicant progressed the Project under the Maritime Area Planning Act (2021) and prepared an EIAR for the Project as per the requirements prescribed in this Act.

The Maritime Area Planning Act (2021), which was enacted in December 2021 allows for a transition from the previous marine management regime, which was provided for under the Foreshore Act 1933, as amended. The Maritime Area Planning Act (2021) establishes in law a marine planning regime and provides that two separate consents are required for the development of offshore renewable energy projects. Firstly, a state consent known as a Maritime Area Consent (MAC) is required to occupy a designated part of the maritime area; and, secondly, a development consent is required to allow for the development of that area.

The Applicant was granted a MAC in December 2022 (Ref. MAC No. 2002-MAC-001).

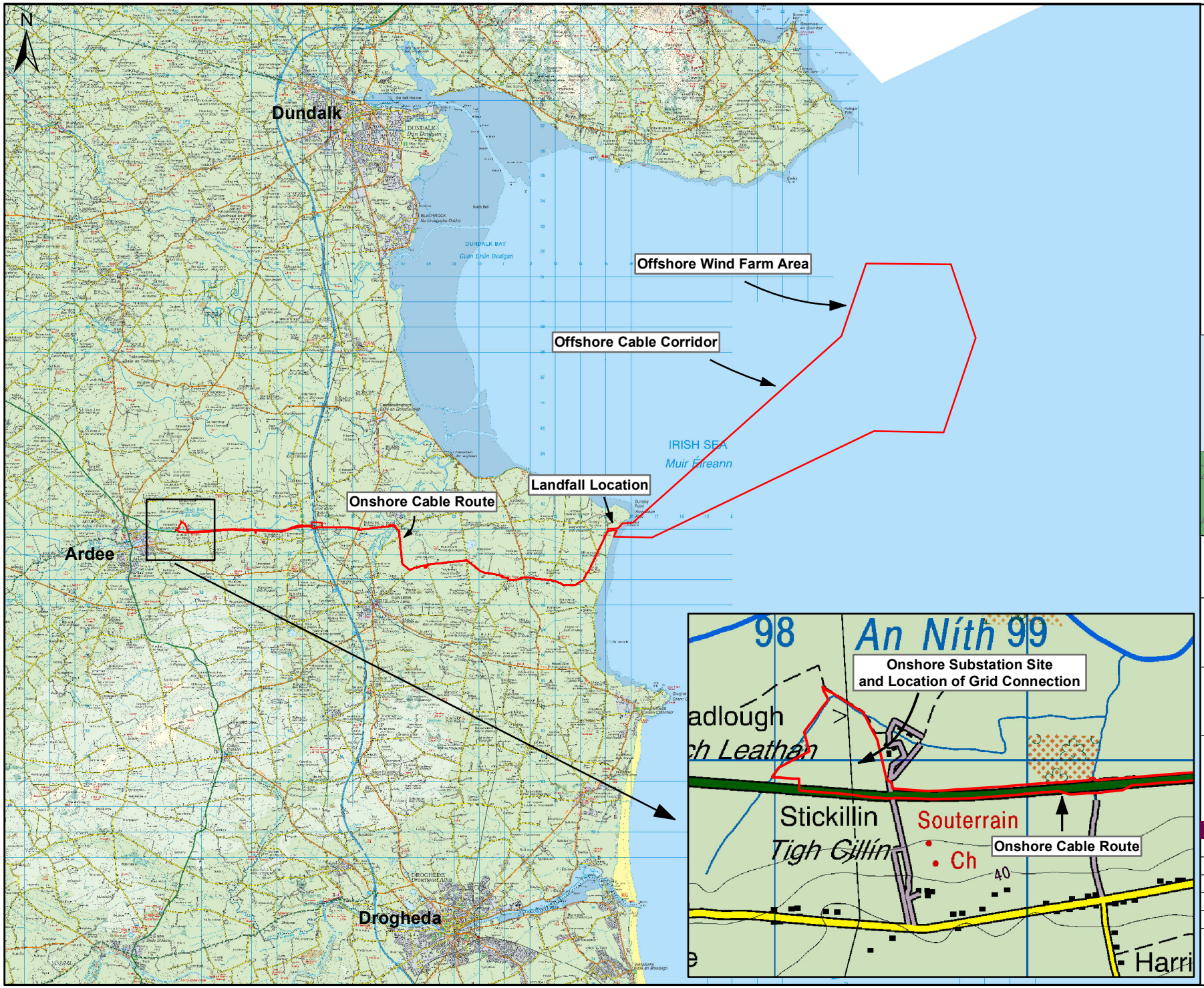
The Applicant has prepared this Environmental Impact Assessment Report (EIAR) to support an application for permission for development consent under the Planning and Development Act 2000, as amended. A number of other supporting documents are required to be submitted as part of the application including a Natura Impact Statement (NIS), Planning Report, Planning Particulars and Planning Drawings.

1.3 Project overview

The Project will comprise of onshore and offshore infrastructure and includes the following key components, which are described further in chapter 5: Project Description.

- 25 wind turbine foundations (monopiles) attached to the seabed and associated scour protection;
- 25 wind turbine generators (WTGs) (each comprising a tower section, nacelle and three rotor blades);
- One offshore substation (OSS) and associated foundation (monopile) attached to the seabed;
- A network of 41 km of inter-array cables linking the individual wind turbines to each other and to the offshore substation and associated cable protection;
- A 16 km offshore cable (located in an offshore cable corridor);
- 20.1 km of onshore cables (three) which will be connected to the single offshore cable at a Transition Joint Bay (TJB), a fully buried concrete chamber located at the landfall. The three onshore cables will be installed in the same trench and buried for the entirety of the length from the TJB to an onshore substation; and
- An onshore substation which will consist of two main parts: Gas insulated switchgear equipment (GIS) located inside a building and outdoor air insulated switchgear equipment (AIS). The GIS will be owned by EirGrid and operated by the ESB Networks as Transmission System Operator. The AIS will form part of the offshore grid which will be owned and operated by EirGrid. Transmission cables from the onshore substation will connect to an existing overhead power line through two new line/cable interface (pylon) masts.

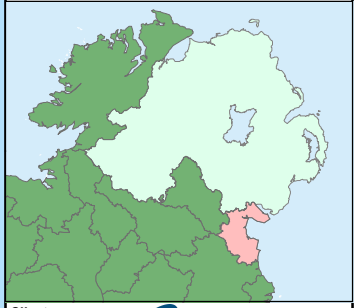
An overview of the Project is presented in Figure 1-1.



Legend

Planning Application Boundary

Data Sources: OWL, OSi.



Client

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

Project

Oriel Wind Farm Project

Figure 1-1:
Overview of Oriel Wind Farm Project

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Issue Details

Drawn By: NR	**Project No.** MDR1520b
Checked By: CC	**File Ref:** MDR1520bArc3072F03
Approved By: CC	**Projection:** ITM (IRENET95) Geographic Co-ordinates: ETRS89
Scale: 1:200,000 @ A4	
Date: 12/03/2024	

2 POLICY AND LEGISLATION

The Project complies with all relevant statutory plans, guidelines, policies and objectives at a European (EU), national, regional and local level. The Project can make an important and meaningful contribution to enabling Ireland to achieve its offshore wind energy target of achieving 5 Gigawatts (GW) of offshore wind capacity.

The following sections provide a summary of the relevant EU, national, regional and local planning policies against which the Project will be assessed.

2.1 EU legislation and policy

The adoption of the European Maritime Spatial Planning Directive (2014/89/EU) established an EU-wide framework for maritime spatial planning. It is aimed at promoting the sustainable growth economies, the sustainable development of marine areas and the sustainable use of marine resources. Ireland transposed the Directive through the Regulations (S.I. No. 352/2016), which were released in 2018 by Part 5 of the Planning and Development (Amendment) Act 2018. Part 5 re-transposes the Directive in primary legislation and contains a number of measures that are additional to those required by the Directive.

The European Green Deal (2019) commits Ireland to achieve carbon neutrality by 2050. The EU's 2030 emissions reduction goals have also been increased to at least a 55% cut by 2030, compared with 1990 levels. The EU Fit for 55 Package (2021) also aims to meet the above targets.

The Renewable Energy Directive 2018/2001/EU sets the overarching European renewable energy target of 32% and establishes rules to ensure the uptake of renewables for heating and cooling purposes and in the transport sector. It also includes common principles and rules for renewables support schemes.

The EU Strategy on Offshore Renewable Energy (2020) was published to help meet the EU's goal of climate neutrality by 2050. The Strategy proposes to make offshore renewable energy a core component of Europe's energy system by 2050 and specifically increase Europe's offshore wind capacity.

REPowerEU (2022) is a European action plan for more affordable, secure and sustainable energy. A key objective is to reduce dependence on fossil fuels and increase European renewables target for 2030 from 40% to 45% (including through wind energy generation).

The European Wind Power Action Plan (2023) sets out immediate actions to be taken to support the wind energy sector. The European Wind Charter builds upon the above plan. Ireland has signed up to this, committing to supporting the development of wind energy production.

Additional policy documents considered in chapter 2, volume 2A of the EIAR include:

- 2030 EU Climate and Energy Framework;
- EU Fit for 55 Package;
- EU Strategy on Adaptation to Climate Change; and
- EU Strategy on Offshore Renewable Energy.

2.2 National legislation and policy

The Maritime Jurisdiction Act (2021) sets out the law relating to the State's maritime jurisdiction and the Maritime Area Planning Act (2021) is a wide-ranging legislative enactment which establishes in law the regime for the maritime area and covers all aspects of planning and the marine environment.

The Climate Action and Low Carbon Development (Amendment) Act 2021 and annual Climate Action Plans (CAP) support the transition to a climate neutral economy. Both CAP23 and CAP24 have the following action: "*Accelerate the delivery of onshore wind, offshore wind, and solar through a competitive framework to reach 80% of electricity demand from renewable energy by 2030*".

Project Ireland 2040 comprises of the National Planning Framework (NPF) and National Development Plan (NDP). The NPF states the maritime economy is a key enabler of effective regional development, especially in remote coastal communities. The most relevant outcomes/objectives include:

- NDP National Strategic Outcome 8: "*transition to a low-carbon and climate-resilient society*"

- NPF National Policy Objective 42: "*To support, within the context of the Offshore Renewable Energy Development Plan (OREDP) and its successors, the progressive development of Ireland's offshore renewable energy potential, including domestic and international grid connectivity enhancements*".

The Marine Planning Policy Statement (2019) seeks the introduction of a single development management process for the maritime area and recognises the need for transitional arrangements for legacy offshore renewable energy projects such as the Oriel Wind Farm Project.

The National Marine Planning Framework supports the development of offshore renewable energy (ORE) projects. The Project is consistent with these policies in that it directly contributes to renewable energy generation, including the following policy:

> "*ORE Policy 1 - Proposals that assist the State in meeting the Government's target of generating at least 5GW of offshore renewable electricity by 2030 and proposals that maximise the long-term shift from use of fossil fuels to renewable electricity, in line with decarbonisation targets should be supported…"*

The draft OREDP II identifies the opportunity for the sustainable development of Ireland's abundant offshore renewable energy resources and will sit alongside and support the implementation of the new forward marine planning framework. The key objectives are to:

- Assess the resource potential for ORE in Ireland's maritime area;
- Provide an evidence base to facilitate the future identification of broad areas most suitable for the sustainable deployment of ORE in Ireland's maritime area; and
- Identify critical gaps in marine data or knowledge and recommend prioritised actions to close these gaps.

Powering Prosperity: Ireland's Offshore Wind Industrial Strategy was published in March 2024, with the objective of ensuring that Ireland fully captures the value of both the supply chain to deliver an Offshore Wind Energy sector at scale, and the routes to market for this renewable energy.

Additional policy documents considered in chapter 2, volume 2A of the EIAR include:

- Energy Security in Ireland to 2030;
- National Energy Security Framework;
- National Policy Statement on Electricity Interconnection;
- Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy;
- National Energy and Climate Plan 2021-2030;
- Ireland's Transition to a Low Carbon Energy Future 2015-2030;
- Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland;
- Wind Energy Planning Guidelines; and
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities.

2.3 Regional policy

The Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly is a strategic plan and investment framework (prepared in accordance with the NPF) to shape the future development of the region to 2031 and beyond. The RSES promotes decarbonising the energy sector and generating electricity from indigenous renewable sources including offshore wind and identifies the importance of enabling infrastructure.

Regional Policy Objective 10.24 is to: "*Support the sustainable development of Ireland's offshore renewable energy resources in accordance with the Department of Communications, Energy and Natural Resources 'Offshore Renewable Energy Development Plan' and any successor thereof including any associated domestic and international grid connection enhancements*."

The RSES supports the development of new transmission infrastructure projects.

It is submitted that the Project is in accordance with the principles of sustainable development as set out in the RSES and is consistent with regional infrastructure policy and objectives which are to be translated into

the local level of the planning policy hierarchy. More specifically, the Project directly delivers increased offshore energy production and much of the necessary supporting infrastructure.

2.4 Local policy

The Louth County Development Plan 2021-2027 (the Louth CDP) sets out the development policies for the county. The Louth CDP contains support for electricity transmission grid related infrastructure, renewable energy and offshore windfarm developments. The most relevant objectives include:

> "*IU 49: To support international, national and county initiatives for limiting and reducing emissions of greenhouse gases through energy efficiency and the development of renewable energy sources at suitable locations, utilising the natural resources of the County, in an environmentally acceptable manner subject to normal proper planning considerations including in particular the impact on areas of environmental or landscape sensitivity.*
>
> *IU 60: To support the development of offshore windfarm developments subject to normal planning considerations, including in particular the impact on areas of environmental or landscape sensitivity*."

In relation to zoning, the proposed onshore cable primarily traverses '*Rural Policy Zone 2 – area under strong urban influence*' and also '*Rural Policy Zone 1 – area under strong urban influence and of significant landscape value'*.

Rural Policy Zone 1 Objectives require assessments to be carried out by a licensed archaeologist where development proposals involve; ground clearance of more than half a hectare or, for linear developments, over 1 km in length or, for developments in proximity to areas with a density of known archaeological monuments and history of discovery. Louth CDP objectives also encourage the retention, appropriate re-use and conservation of vernacular buildings in this zoning area.

2.5 Northern Ireland policy

The Strategic Planning Policy Statement for Northern Ireland sets out the Department for Infrastructure's regional planning policies for securing the orderly and consistent development of land in Northern Ireland (NI). One of the regional strategic objectives in relation to the coastal development is to "*facilitate appropriate development in coastal settlements and other parts of the developed coastline (subject to all other relevant planning policies) that contributes to a sustainable economy and which is sensitive to its coastal location."*

The draft *Marine Plan* for NI will, when adopted, inform and guide the regulation, management, use and protection of the marine area for the region. The following objective (No. 3) is relevant to the proposed development: "*To help realise the potential of energy resources and energy storage within the marine area, while fully considering the requirements of other marine interests*".

2.6 Conclusion

An overarching objective of the policy and legislative provisions outlined above has been to address climate change and achieve a decarbonised environment. The Project will contribute to:

- Contributing to the achievement of Ireland's 2030 renewable energy targets and the 2050 net-zero emissions targets;
- Enabling Ireland to sustainably harness its offshore renewable energy potential;
- Protecting residential and visual amenity; and,
- Protecting the environment and enabling a sustainable rural economy and society.

It is considered that, subject to compliance with the mitigation measures set out in the EIAR and the NIS, the Project is in accordance with all relevant European, national and regional and local policies and guidelines. It will also assist in the delivery of key strategic energy objectives and land use development policies, set out in European, National, regional, and local documents, statements, policies and plans.

3 EIA METHODOLOGY

The EIAR presents an EIA methodology that has been used in the assessments to quantify the likely significant effects of the Project on the environment, and where necessary recommend mitigation measures and monitoring to protect the environment from any potential negative effects arising from the Project.

The following key stages formed the basis for the identification and assessment of impacts undertaken to inform the EIAR:

- Specialists undertook a review of the description of the Project (see chapter 5: Project Description) to understand the activities that have potential for effects and to define a suitable study area to establish a baseline and allow for an assessment of each specialist topic;
- A robust baseline of the existing environment on and around the Project was established using sources of information to inform the assessment including desktop review of available data and literature, interpretation of site specific surveys where required and considering relevant feedback from the consultation process;
- Specialists assessed the environmental impacts and established their significance. This process utilised an iterative approach, where impacts that were initially assessed as significant were discussed with the Applicant and the design team to allow changes to be incorporated into the design to reduce or offset the impact; and
- Development of mitigation measures to ameliorate the potential impacts of the Project that cannot be avoided practically through design.

3.1 Identification and assessment of impacts

The Project has the potential to create a range of ‘impacts’ and ‘effects’ on the environment. For the assessments presented in the EIAR the term 'impact' is used to define a change that is caused by an action. For example, piling of wind turbine foundations (action) during construction which results in increased levels of subsea noise (impact). Impacts can be classified as direct, indirect, secondary, cumulative and interactive. They can be positive, neutral or negative.

The term 'effect' is used in the assessments to express the consequence of an impact. For example, in the offshore environment the piling of wind turbine foundations (activity) results in increased levels of subsea noise (impact), with the potential to disturb marine mammals (effect). Or in the onshore environment, the installation of cables using horizontal directional drilling to cross under a road or stream (activity) results in increased levels of airborne noise (impact), and potential disturbance to noise sensitive receptors (i.e. people or ecological receptors) (effect).

For each of the impacts assessed in this EIAR, a magnitude has been assigned. In assigning magnitude, the spatial extent, duration, frequency and reversibility of the impact from the phases of the Project have been considered, where applicable.

Sensitivity refers to the potential of a receptor to be significantly affected as outlined in the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment (EPA, 2022) (hereafter ‘EPA Guidelines’). In defining the sensitivity for each receptor, the vulnerability, recoverability and value/importance has been taken into consideration where relevant.

The overall significance of an effect is then determined by correlating the magnitude of the impact alongside the sensitivity of the receptor. A matrix approach or similar has been adopted in the majority of assessments to guide topic-specific assessments.

By cross-referring the magnitude of impact with the sensitivity of the receptor, a significance of effect may be assigned for all impacts. The significance ratings, for example outlined in the EPA Guidelines range from imperceptible, slight, moderate, to major or profound. In general, for the purposes of the assessments included in this EIAR, a significance of effect of moderate or greater is considered 'significant' in EIA terms.

The definitions for each of the significance levels are defined by the topic specialist. The EPA Guidelines provides useful guidance on the typical classifications for significance of effect levels although recognises that more specific definitions will exist for some topics.

3.2 Design of the Project

A description of the Project is provided in chapter 5: Project Description. It provides information on the site, design, size and other relevant features and sets out the design parameters of the Project for the purposes of environmental assessment. To inform the assessment of likely significant impacts during the construction phase, details are also provided on construction requirements such as working areas, hours of work, principal construction methods, volumes of materials to be managed and removed offsite, traffic and vessel numbers and environmental controls.

For each of the impacts assessed within the assessment chapters (chapters 7 to 31), the project design parameters are identified in table format from the information provided in chapter 5: Project Description.

The Project design includes a number of 'designed-in' measures which are considered inherently part of the design of the Project. These designed-in measures are standard measures applied to offshore wind development, including, for example, lighting and marking of the wind farm or the use of 'soft-starts' for piling operations, to reduce the potential for impacts. As there is a commitment by the Project to implement these measures, they are considered inherently part of the design of the Project and have therefore been considered in the assessments presented in chapters 7 to 31.

The designed-in measures include a commitment by the Project to prepare a number of consent management plans. These consent management plans translate the commitments made in the EIAR into practical management plans relevant to the refined project design (the refined project design being the final project components selected from the wider design parameters assessed in the EIAR). These will form the basis for discussion with the consenting authority and appropriate stakeholders and final plans will be submitted for approval by the consenting authority prior to construction. As noted above, these consent management plans are considered standard industry practice for this type of development. These consent management plans are set out in chapter 5: Project Description.

3.2.1 Design flexibility

The Applicant has sought to complete the design of the Project to as detailed a level as possible. The capacity of the wind farm, the number of turbines and turbine size, the type and number of inter-array cables, the offshore substation and a single offshore cable corridor have all been selected. The turbine and offshore substation dimensions are known and fixed. A monopile foundation has been selected for the turbines and the offshore substation and its main parameter requirements are known. The location of turbines and offshore substation have been identified (subject to a 50 m radius of lateral deviation during construction). The route for the onshore cable route and the infrastructure requirements have been designed and all necessary landowner agreements have been obtained. The location of the onshore substation site to connect the wind farm to the existing transmission grid has been identified and the landowner agreements are in place. The design for the grid connection from the offshore substation through to the existing transmission grid has been completed in consultation with EirGrid and to the EirGrid function specification.

As there are a few elements of the design that require refinement and finalisation which cannot be completed in advance of an application, the Applicant submitted an application for an opinion under Section 287B of the Planning and Development Act, 2000 as amended, for consideration of the design flexibility required for the Project.

The design flexibility opinion by An Bord Pleanála states that the following details of the Project may be confirmed after the proposed application has been decided:

1. The final exact location of each offshore wind turbine and the offshore substation;
2. The final height of offshore infrastructure;
3. The final route and length, of the offshore export cable and offshore inter-array cables;
4. The location and layout of the landfall transition joint bay; and
5. The final design for the type and siting of outdoor equipment within the proposed onshore substation compound.

Chapter 5: Project description provides further information on the above details and design flexibility. The consequences of not confirming the above details until post application on the impact assessments are addressed in the relevant assessment chapters in the sub-section titled' Project design parameters' (in volume 2B and 2C). For example, due to the potential for unexpected ground conditions and obstructions, the final route and length of the offshore cable can only be confirmed during construction. Therefore, the assessments have considered a maximum length of 16 km, although in reality it is expected to be less than this. This method ensures that the greatest potential for effects on sensitive receptors are considered. By assessing these parameters, the EIAR contains adequate information to enable assessment of the potential impacts that are likely to give rise to the greatest environmental effects. It also allows the final design to vary within this parameter without rendering the EIAR inadequate.

3.3 Cumulative Impact Assessment (CIA)

Cumulative effects are defined in the EPA Guidelines as "*the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*".

The Cumulative Impact Assessment (CIA) considers the likely impacts arising from the Project alongside the likely impacts of other development activities in the vicinity of the Project, based on publicly available information. These interactions may arise during any phase of the Project (i.e. construction, operational and maintenance and decommissioning phases).

A three-staged process has been followed in order to methodically and transparently search for other projects that may be considered cumulatively alongside the Project. This involved a stepwise process that considered the level of detail available for projects, as well as the potential for interactions with the Project on a conceptual, physical and temporal basis.

Those projects considered cumulatively with the Project are considered in each relevant topic chapters (7-31) of the EIAR (see subsection titled 'Cumulative Impact Assessment'). To inform the CIA, the Applicant also engaged with the other Phase 1 developers on the east coast of Ireland as these projects were considered cumulatively with the Project.

3.4 Transboundary effects

The need to consider transboundary effects has been embodied by the United Nations Economic Commission for Europe (UNECE) Convention on EIA in a Transboundary Context, adopted in 1991 in the Finnish city of Espoo and commonly referred to as the 'Espoo Convention'. The Convention requires that assessments be extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Article 7 of the EIA Directive introduces similar requirements concerning projects carried out in one Member State but likely to have significant effects on the environment of another. This corresponds to the EPA Guidelines (2022), which outlines that in the case of an EIAR, for any project that is likely to cause significant transboundary effects, contact with the relevant authorities in other Member States should be made.

As part of EIA scoping, consultation was undertaken with the departments and ministries in Northern Ireland, Great Britan (Scotland, England and Wales) and the Isle of Man regarding the potential for the transboundary impacts from the Project. Details on the consultation is provided in chapter 6: Consultation.

In each of the assessments in volume 2, potential for transboundary effects is listed under the heading titled 'Transboundary effects'.

4 CONSIDERATION OF ALTERNATIVES

The EIAR provides a description of the alternatives considered by the Applicant during the site selection and design of the Project.

Alternatives are different ways of conducting a project in order to meet its agreed objective. The consideration of alternatives is an important step in determining, and where possible avoiding, the effects of a project on the environment through spatial and technical adjustments.

The following sections provide a summary of the main alternatives considered for the Project.

4.1 'Do-nothing' baseline scenario

The do-nothing scenario refers to what would happen if the Project would not be developed. Under this scenario, the Project would not contribute to meeting Ireland's renewable and de-carbonisation targets. The absence of the Project would translate into long-term challenges for Ireland's ability to meet its CO_2 targets and achieve sustainable development and would contribute to the following effects:

- Ireland would be tasked with a greater challenge in terms of achieving its climate goals;
- Ireland would continue to degrade its atmosphere and environment through the continued use of finite fossil fuels;
- Ireland could miss out on the employment and investment from the Project; and
- Ireland could have to continue paying EU fines for missing the 2020 renewable energy targets.

4.2 Alternative offshore wind farm locations

4.2.1 National assessment

Initially, the Applicant conducted a national assessment of suitable areas for offshore wind development using the following critical parameters as a guide: wind capacity, water depth, wave and current loading, suitable seabed sediments, onshore grid capacity, the avoidance of environmentally sensitive areas and disturbance to other marine based activities such as fisheries and shipping traffic.

The east coast of Ireland was selected as the preferred location to develop the Project because of its excellent wind resource, less severe wave climate, suitable water depths and seabed sediments, and good electricity grid infrastructure.

4.2.2 Irish Sea assessment

Following the national assessment, the Irish Sea was assessed for suitable offshore wind farm locations. Sites on the long narrow sand banks along the Wicklow and Wexford coast south of Dublin Bay were considered (i.e. Kish, Bray, Codling, India and Blackwater banks), however, the capacity within the grid infrastructure for these locations without significant upgrade is limited.

The area north of Dublin has available grid capacity for a suitable scale of offshore wind farm. It also had a number of possible locations with extensive water depth suitable for the construction of current offshore wind technology and which provided opportunities to locate wind turbines to minimise environmental effects.

The north Irish Sea area was evaluated against detailed constraint mapping of the critical parameters such as metocean, bathymetry, existing fisheries and grid access, and this is presented below.

4.2.3 Regional assessment

A broad area between the entrance to Drogheda Harbour and the border with Northern Ireland was assessed to identify a suitable offshore wind farm area and export cable corridor for the Project. A number of criteria were evaluated to determine an area suitable for consideration of an offshore wind farm, including:

- Wind resource >9 m/s;
- Shelter from high wave loads;

- Suitable seabed sediments;
- Low tidal streams (<0.5 m/s max);
- Bathymetry water depth of <30 m;
- Avoidance of sensitive seabed habitats, nursery spawning grounds and European designated sites, where possible;
- Areas of limited fishing and shipping activity preferred;
- Low density of recreational marine users;
- Avoidance of existing marine infrastructure and shipping lanes;
- Potential landfall sites with proximity to existing high voltage transmission grid network; and
- Proximity to ports suitable for construction and operation and maintenance.

4.2.4 Project site location assessment

An area to the east of Dundalk Bay that met the above criteria was identified. This area was extensive and required further detailed exploration to delineate a preferred site within this preferred strategic location that was best suited for the development of the Project.

A Foreshore Licence was granted in 2005 to undertake a technical work programme and investigations to assess the suitability of the area for an offshore wind farm. The outcome of these investigations determined the suitability of the location for an offshore wind farm and allowed for the focused determination of a preferred site within the extensive Foreshore Licenced Area.

Four site options within the Foreshore Licence Area were brought forward for consideration.

The preferred option was selected as it encompassed a smaller area in the northern part of the Foreshore Licence area and was deemed the preferred option as it:

- Avoids areas of hard ground and shallower water to the northwest of the area;
- Avoids European designated sites[1];
- Avoids fisheries area in the mud beds to the south;
- Avoids shipping lanes; and
- Is the appropriate size.

The preferred location was reviewed again in 2023-2024 as part of the development of the EIAR and was still considered the preferred option.

4.3 Alternative wind turbine layout

4.3.1 Evaluation criteria for wind turbine layout

The assessment of layout options focused on the potential for impacts on landscape and seascape but was cognisant of other criteria particularly for offshore search and rescue access. The more favourable offshore layout option would generally feature the lowest number of wind turbines of shortest tip height. However, in the case of the Project, the options considered generally vary between a smaller number of taller wind turbines or a larger number of shorter wind turbines. The criteria used in the evaluation of layout options are as follows:

- Turbine size;

[1] A new candidate SPA, named the North west Irish Sea cSPA was proposed in July 2023. The selected Option 4 offshore wind farm area does not overlap with this cSPA. A section of the offshore export cable on the approach to the landfall will cross the cSPA.

- Turbine layout/array;
- Turbine grouping; and
- Search and Rescue Access

4.3.2 Wind turbine layout options

An initial proposal for 55 WTGs of 6 MW capacity was prepared for the Project in 2007. This followed a gridded pattern across the full area identified in the then Foreshore Lease application. The turbines proposed in 2005 for the Project are no longer available and an updated comparative assessment of options for wind turbine array layouts was carried out for the Project using the available and proposed technology. Therefore, a preliminary comparative assessment of design options for the wind turbines within the identified option area from a landscape, seascape and visual amenity perspective was prepared.

The purpose of this assessment was to present preliminary findings in regard to likely significant effects associated with key landscape, seascape and visual receptors and to present a comparative analysis of turbine options for the Project.

Seven plan layouts in gridded and irregular spacing of turbines were assessed from a number of viewpoints. These vary in terms of turbine type, capacity, number and tip height above Lowest Astronomical Tide (LAT).

4.3.3 Wind turbine layout assessment

The assessment of the seven layouts from the viewpoints indicated a number of outcomes for consideration in the final layout:

- The 25 turbine layout appeared more compact from a number of viewpoints. The removal of turbines from the northwest of the site reduced the energy yield from the wind farm but increased the distance of the nearest wind turbine to the closest shore and viewpoint by 20%.
- The 25 turbine layout was defined along a specific orientation of 021°N for Search and Rescue access. The final layout required a limited deviation from this alignment due to soil conditions for the foundations. The range of this deviation was from 0 to 188 m.
- The 10 MW turbines appeared slightly smaller to the viewer than the 14 and 15 MW turbines from a number of viewpoints, but higher in density.

The preliminary assessment determined that the most favourable layout, as seen from the maximum number of viewpoints, will have the following:

- Consistent and simple pattern with consistent spacing between individual wind turbines and avoiding gaps which appear to split the wind farm;
- Minimal clustering of wind turbines which present in the view as a dense grouping of structures that would be more visible than single turbines aligned in a line; and
- General alignment of turbines along a specific orientation for Search and Rescue access.

A 25 turbine layout (option 6 as presented in volume 2, chapter 4 of the EIAR) was selected

4.4 Alternative offshore cable corridor

4.4.1 Evaluation criteria for offshore cable corridor options

An offshore cable is required to connect the offshore wind farm to the landfall. At this location the offshore cable connects to the onshore cables. This cable is buried within the seabed where possible. Where hard ground is encountered, the cable is surface laid and protected by rock armour.

The offshore cable corridor is constrained by the selected location of the wind farm area and the preferred locations for the landfall, onshore substation and onshore cable route.

Evaluation criteria similar to those outlined above in section 4.2.3 were used for the consideration of the potential offshore cable corridors. Nine cable corridor options were considered.

4.4.2 Offshore cable corridor assessment

An evaluation of the options for the cable corridor was undertaken using a scoring system against a number of criteria.

The offshore cable corridor with the lowest score was selected as the preferred option. Geophysical mapping indicated that suitable sediments for burial were present between the offshore wind farm area and the landfall. Some limited laying of cable on the seabed and protection by rock armour will be required. Low tidal currents (<0.5 m/s) are present throughout the area and water depths of <30 m are present throughout the offshore cable corridor. No sensitive benthic habitats were identified. Nursery spawning grounds for Herring were identified in the area but are limited within the offshore cable corridor. No Special Areas of Conservation (SACs) are present.

The preferred corridor was reviewed again in 2023-2024 as part of the development of the EIAR. Approximately 2 km of the offshore cable corridor overlaps with the recently designated North west Irish Sea candidate Special Protection Area (cSPA). However, the proposed construction works are temporary and the extent of the cable corridor within the SPA is minimal (0.09%[2]). On review of the assessments and information on the baseline environment outlined in the EIAR, along with relevant datasets and reports published since the corridor was first selected, the selected option is still considered the preferred option.

4.5 Alternative locations for Operation and Maintenance Base

An operation and maintenance base is required to service and maintain the wind farm. It requires shore-side offices and warehouse facilities with relatively easy access to a berth for a crew transfer vessel (CTV). A CTV will take offshore staff to and from the wind farm on a regular basis during suitable weather conditions. A number of evaluation criteria was used for the consideration of potential locations for Operation and Maintenance base.

There are a number of existing ports and harbours with the facilities to operate an offshore wind farm in the Irish Sea. As regular access is required to the wind farm, a short journey time is preferred. Potential existing ports and harbours (from south to north) include Dublin Port, Drogheda Port, Dundalk, Greenore Port, Warrenpoint, Kilkeel and Belfast Port. An assessment of the reasonable potential options was undertaken having regard to existing harbour facilities, shipping and navigation criteria such as acceptable travel time and distance to the wind farm.

The preferred locations for an operations and maintenance base were Greenore Port, Warrenpoint or Kilkeel. These are preferred as they are in close proximity to the offshore wind farm area with an acceptable travel time for a crew transfer vessel. The harbours are not restricted by any tidal constraints and have existing facilities for the proposed activities.

4.6 Alternative onshore infrastructure options

4.6.1 Evaluation criteria

A number of criteria and constraints were used to evaluate options for the landfall, substation location, and onshore cable route. These included examining constraints relating to land use, designated areas for biodiversity and landscape, flood risk and cultural heritage features. A number of guiding principles were also used in the selection process to minimise potential impacts on the environment. These principles were as follows:

- Population centres to be avoided where possible;
- Proximity to residential dwellings to be minimised where possible;
- European designated sites to be avoided where possible;

[2] The extent of works within the offshore cable corridor will be much less than this, as described in chapter 5: Project Description.

- National designated sites to be avoided where possible; and
- Regional/local designated sites to be avoided/impacts minimised where possible.

4.6.2 Landfall site options

15 landfall options along the coast from the Cooley Peninsula to Bremore were evaluated using geographic information systems and desktop study data. A landfall at Dunany (south) was selected as the preferred option from an environmental perspective and also because if was able to accommodate temporary works.

4.6.3 Onshore substation site

It was decided that the most appropriate connection method for the Project would be a single circuit 220 kV connection looped into the existing 220 kV transmission circuit between the Woodland and Louth substations. Functional specifications provided by EirGrid of the infrastructure required to complete this connection indicated that a new 220 kV substation would be required in the vicinity of the existing 220 kV line.

11 sites for the onshore substation location were evaluated using geographic information systems and desktop study data. The site at Stickillin was selected due to the separation distance between the nearest dwellings and its location directly beneath the Woodland to Louth 220 kV line.

4.6.4 Onshore cable route options

12 onshore cable route options were considered from Dunany were evaluated using geographic information systems and desktop study data. All onshore cable route options require crossing the M1 motorway, the railway line and R132 as these features run north to south in the area that was considered.

The preferred onshore cable route was selected because it is not in proximity to European sites and it follows a more straightforward route along local roads avoiding sharp bends. It does not traverse land zoned for development and does not pass through any known areas of historic landfill or contamination.

4.7 Alternative Project design and technology

4.7.1 Foundation options

Three different foundations types were considered for the WTG and OSS. These included monopile, jacket and gravity base foundations.

Monopile foundations typically consist of a single hollow steel tube installed at depth into the seabed. Tripod jacket foundations comprise a steel lattice structure, with tubular steel members and welded joints, secured to the seabed by hollow steel pin piles. Gravity base foundations are heavy steel, concrete, or steel and concrete structures, sometimes including additional ballast, that sit on the seabed to support the turbine tower.

A number of criteria were evaluated to determine the preferred foundation type including:

- Marine processes (suitable seabed sediments; low tidal streams (<0.5 m/s max); and bathymetry water depths of <30 m);
- Impacts of sensitive seabed habitats and European Designated Sites;
- Areas of limited fishing activity preferred; and
- Amount of embodied carbon per foundation type.

On the basis of the assessment, the monopile foundation was chosen as the preferred foundation option as it results in less disturbance to the seabed sediments and marine mammals than jacket and gravity foundations and it has the least amount of embodied carbon.

4.7.2 Management of drill arisings

Drill arisings during the installation of the foundations include soil and rock. It is proposed that these drill arisings will be returned to the area adjacent to the foundation location below the sea surface. This will be undertaken through a fall pipe from the drilling vessel to minimise the dispersion within the water column. The Environmental Protection Agency (EPA) has indicated that this activity will require a Dumping at Sea Permit (obtained from the EPA). The following alternative ways to manage the drill arisings were considered:

- Beneficial re-use;
- Disposal on land;
- Incineration; and
- Disposal at sea.

Disposal at sea was selected as the preferred option. The other options were considered technically and environmentally unfeasible due to the quantity of material arising from the activities, the activities required to make the material suitable for reuse and the low likelihood of finding suitable sites for this type of material for beneficial re-use.

4.7.3 Offshore cable construction at the landfall

Two options were considered for the installation of the onshore cable on approach to the landfall:

- Horizontal direction drilling; and
- Temporary trenching activities.

Trenching was considered preferable as it does not limit the thermal properties of the cable and can be undertaken without resulting in signficant environment effects at the landfall. Furthermore, an open trench can be undertaken within a narrow working area, the works are temporary in nature and all excavated material can be reinstated. Trenching also avoids the need for an entrance pit (on land) and an exit pit in the subtidal environment.

4.7.4 Alternative TJB construction methods

A number of options for the construction of TJB were considered to minimise impacts on the Dunany Point County Geological Site (CGS) and also to avoid the need for coastal protection. These included adjusting the location of the TJB to minimise excavation into the sea cliff at Dunany and the use of a sheet pile trench to minimise the works in the sea cliff.

4.7.5 Onshore cable technology options

Two options were considered for the arrangement of the onshore cable; a trefoil arrangement and a flat arrangement. A trefoil option was selected as the preferred option as it results in a narrower trench arrangement and consequently a reduced working area thereby minimising the extent of disturbance. It is also a more economically viable option.

4.7.6 Substation alternative design options

Three alternative types of substation designs were examined for the connection of the Project to the national grid: an AIS substation, a GIS substation or a hybrid of both.

A number of factors were used to evaluate options for the substation type including extent of land take, proximity to dwellings, the use of SF_6. Following the evaluation of the three options, the hybrid option of an AIS substation for the connection to the offshore transmission system and a GIS substation for the onshore transmission connection was selected as the preferred option. This was because the hybrid option results in a lesser land take than the AIS option and is a compromise on the use of SF_6 gas for insulation. The GIS building provides screening of the AIS compound for properties to the south of the site.

5 PROJECT DESCRIPTION

Figure 1-1 (in section 1.3) provides an overview of the Project, which is divided into the following main elements:

- The offshore wind farm area: This is where the offshore wind farm infrastructure will be located. This area will include the offshore wind turbines (also referred to as wind turbine generators (WTGs or turbines) including their foundations, the offshore substation (OSS) and its foundation, the inter array cables (i.e. the cables that run between each of the WTGs and the OSS) and a short section of the offshore cable from the OSS;
- The offshore cable corridor: This is where the offshore cable will be largely located. The offshore cable extends from the offshore wind farm area to a landfall location south of Dunany Point. The offshore cable connects to the onshore cables in the Transition Joint Bay (TJB);
- The onshore cable route: This is where the onshore underground cables and associated underground components (joint bays and link boxes) will be located; and
- The onshore substation site: This is where the onshore substation as well as the connections to the existing electricity transmission grid will be located.

An overview of the onshore and offshore infrastructure is presented below and schematically in Figure 5-1.

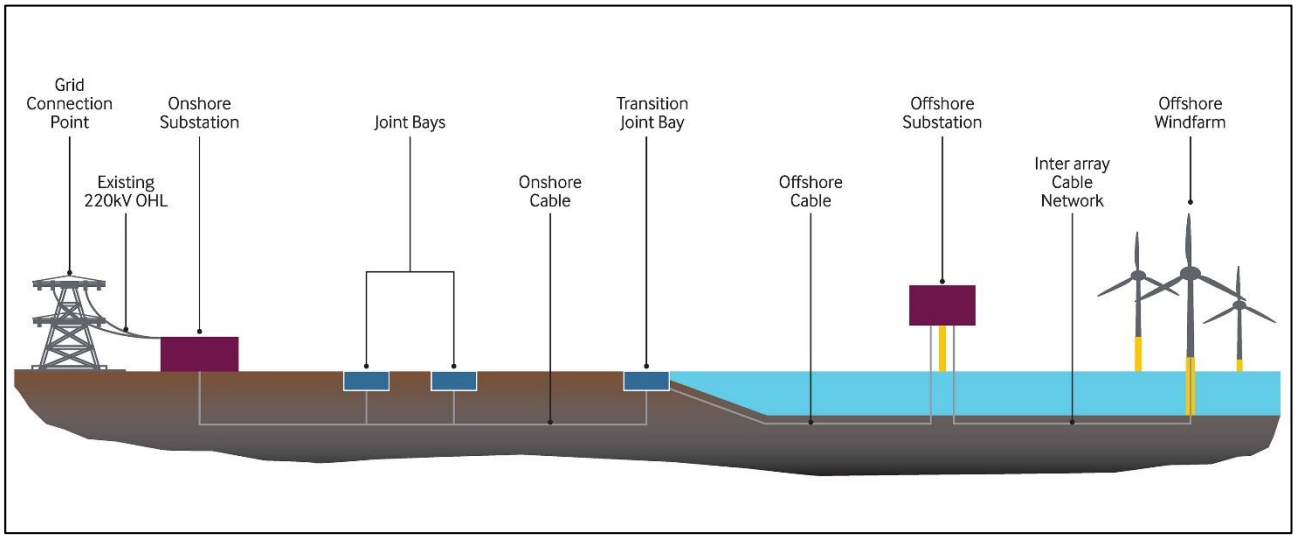

Figure 5-1: Key components of the Project.

5.1 Description of the offshore infrastructure

5.1.1 Site preparation activities

A number of site preparation activities may need to be undertaken within the offshore wind farm area and along the offshore cable corridor prior to the commencement of construction. These activities include:

- Pre-construction surveys;
- Route clearance survey of the final foundation locations and cable routes (inter array and offshore cable) will be undertaken following a pre-construction survey; and
- Boulder clearance and sand wave removal along a 15 m corridor to allow for cable installation.

5.1.2 Wind turbines

The Project will comprise 25 wind turbines. Each wind turbine will be a three-bladed, horizontal rotor axis type, designed for offshore conditions. Figure 5-2 provides an illustration of the proposed wind turbine design. Figure 5 3 shows an installation vessel installing wind turbine blades.

The final height of the wind turbines will be confirmed following detailed geotechnical investigations and analysis of ground conditions. The wind turbine hub height will vary within the range 145-152 m above Lowest Astronomical Tide (maLAT) across the wind farm site due to the specific height of each foundation.

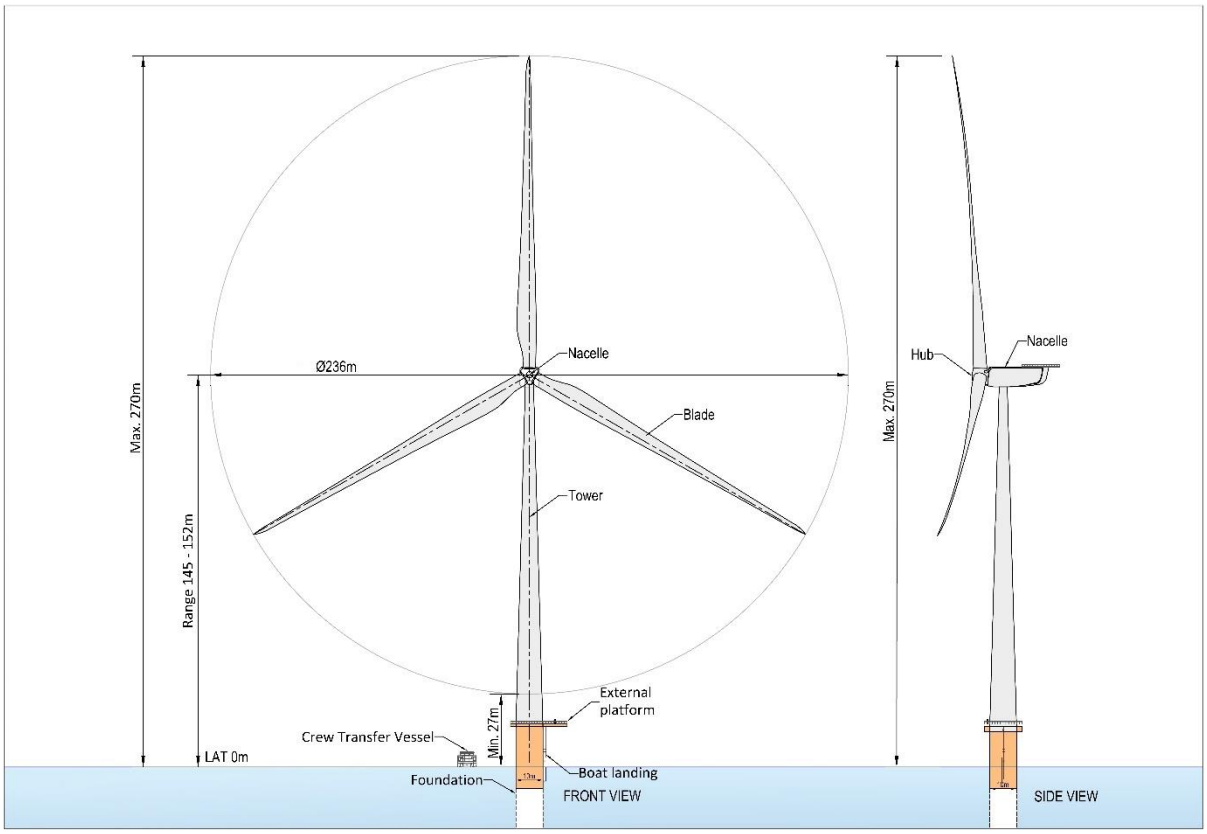

Figure 5-2: Illustration of the proposed wind turbine design.

Wind turbine components will be collected from the marshalling harbour by an installation vessel. This vessel will typically be a Jack-Up Vessel (JUV) to ensure a stable platform for the WTG installation task when on site. The installation vessel will then transit to the offshore wind farm area and the components will be lifted onto the pre-constructed foundation structure by a crane on the installation vessel.

All wind turbines of a wind farm are connected to a central Supervisory Control and Data Acquisition (SCADA) system for control of the wind farm remotely at the operational and maintenance base. This allows functions such as remote wind turbine shutdown if faults occur or curtailment of the wind farm by the grid operator.

Figure 5-3: Installation vessel installing wind turbine blades.

5.1.3 Wind farm area layout

The wind farm area layout has been designed such that it complies with the following principles:

- All surface offshore infrastructure is confined within the area designated by the Maritime Area Consent (MAC) for the Project;
- A minimum spacing of 4 x maximum rotor diameter (i.e. at least 944 m) is maintained between the centre points of all wind turbines;
- The wind turbine layout meets the requirements to facilitate Search and Rescue (SAR);
- The wind turbine layout seeks to avoid clustering of wind turbines from key viewpoints; and
- The wind turbine layout seeks to avoid visual overlap with background landscape from land-based viewpoints.

5.1.4 Foundations

The WTGs and OSS will be attached to the seabed by a monopile foundation. The height and depth of each foundation is dependent on the loading requirements from each structure (WTG and OSS) and the specific geology encountered at each site.

Monopile foundations consist of a single steel tubular cylinder, formed by a number of sections of rolled steel plate (called cans) which are welded together. A transition piece is fitted over the monopile and secured via bolts or grout. The transition piece includes boat landing features, ladders, a crane, and other ancillary components as well as a flange for connection to the wind turbine tower. The transition piece is painted yellow and marked per relevant regulatory guidance from the Commissioner of Irish Lights (CIL), Marine Survey Office (MSO) and the Irish Aviation Authority (IAA) and may be installed with the monopile or separately following the monopile installation.

All monopile foundations will be installed using a combination of piling followed by drilling. When piling installation is not possible due to the presence of rock or hard soils a drill will be inserted into the monopile and material will be drilled out to the required depth.

Scour protection will be installed around each foundation to prevent scour holes developing around the installed structures.

5.1.5 Inter-array cables

Inter-array cables will carry the electrical current produced by the WTGs to the OSS. Inter-array cables will be installed from a dedicated cable-laying vessel using ploughing or jetting methods. Where the cable cannot achieve target burial depth due to ground conditions, cable protection will be deployed. Cable protection will include either rock placement and/or concrete/steel mattresses. It is anticipated that up to 50% of the inter-array cable route may require cable protection.

5.1.6 Offshore substation (OSS)

An OSS is a prefabricated structure housing electrical equipment to provide a range of functions such as regulating and increasing the voltage level to reduce electrical losses and monitoring, protection and control of the electrical infrastructure. The OSS will not be manned but once functional will be subject to periodic operational and maintenance visits.

The OSS will comprise a platform with decks, attached to the seabed by means of a monopile foundation, containing equipment required to switch and transform electricity generated by the wind turbines to a higher voltage and provide reactive power compensation. It will house auxiliary equipment and facilities for operating, maintaining, and controlling the substation. There will be a telecommunications mast on one corner of the platform and a crane.

The OSS will be equipped with a drain system to collect and contain any leakages from equipment containing environmentally damaging fluids.

5.1.7 Offshore cable

A single High Voltage Alternating Current (HVAC) offshore cable rated at 220 kV will be used for the transfer of power from the offshore substation to the landfall. The cable will be located within the offshore cable corridor. The cable will be buried below seabed level where possible and additional protection measures (i.e. rock placement and/or concrete/steel mattresses) will be used where burial is not possible due to any physical constraints posed by seabed sediment conditions.

5.1.8 Landfall and Transition Joint Bay (TJB)

The offshore cable will make landfall approximately 700 m south of Dunany Point, Co. Louth. Two options for the location of the TJB have been identified. The location for the TJB is dependent on cable and soil properties.

The offshore cable will be installed in a buried trench in the intertidal area and will connect to the TJB located above the high water mark. A photograph illustrating the cable installation techniques is presented in Figure 5-4 for information. A temporary construction compound at the landfall will be required for the works.

Figure 5-4: Photo showing installation of a cable in a trench at a landfall.

5.1.9 Construction vessel activities

During the construction of the Project, a number and variety of vessels will be utilised for installation, support and transport of personnel, equipment and infrastructure to the offshore wind farm area and the offshore cable corridor. A total of nine vessels and 475 vessel movements (return trips from a marshalling harbour to site and back again) are proposed during the construction phase.

5.1.10 Construction port

The main offshore structures (WTGs, OSS, foundations and offshore cables) will be fabricated at a number of manufacturing sites across Europe or elsewhere, to be determined as part of a competitive procurement process following award of consent.

A marshalling harbour will be required to stockpile and pre-assemble components for the foundations and wind turbines. The fabricated components will be delivered to the marshalling harbour by ship, before pre-assembly and then delivered by ship directly to the offshore wind farm area for installation/final assembly.

A port that has the required facilities and consents/permissions for the pre-assembly operations will be used. There are suitable ports that are being considered for the Project within the Irish Sea and Celtic Sea.

5.1.11 Aids to navigation, colour, marking and lighting

The lighting and marking of the wind turbines and the OSS is presented in a Lighting and Marking Plan that has been prepared for the Project. This is based on the recommendations of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA, 2013) and will be agreed with the CIL, Irish Coast Guard (IRCG), the MSO, the IAA and the Department of Defence.

The positions of all infrastructure will be conveyed to the CIL and the UK Hydrographic Office (UKHO) so that they can be incorporated into Admiralty Charts and the Notice to Mariners procedures.

5.2 Description of the onshore infrastructure

5.2.1 Onshore cable

The single offshore cable will connect to three onshore cables at the TJB to transfer the power onwards to the onshore substation. The three onshore cables will be installed in the same trench and will be buried for the entirety of the length from the TJB to the onshore substation. The onshore cable route will for the most part run along the existing public road. Where the onshore cables are required to pass under obstructions such as the River Dee or M1 motorway the onshore cable route diverts to agricultural fields adjacent to the road from where ducts are drilled under the obstruction and the onshore cable installation undertaken. Once installed a permanent wayleave of 5 m in width will be maintained at all locations where the onshore cable route is installed away from the public road. This is in accordance with the functional specification of EirGrid.

The route of the onshore cable is located within the following townlands in Co. Louth: Dunany, Mitchelstown, Port, Nicholastown (Barony of Ferrard), Boycetown, Togher, Clonmore, Tullydonnell, Corstown (Electoral Division of Drumcar in the Barony of Ardee), Corstown (Electoral Division of Dunleer in the Barony of Ferrard), Drumcar, Mullincross, Charleville, Dromgoolestown, Richardstown (Electoral Division of Stabannan in the Barony of Ardee), Harristown, and Stickillin. The onshore substation site is located in Stickillin.

5.2.2 Onshore cable installation

Prior to any construction taking place a number of pre-construction surveys will be required including biodiversity surveys, utility surveys and site investigations. The onshore cable installation will comprise of the following main activities:

- Site-preparation/enabling activities – temporary construction compounds and site access roads will be set up at seven locations along the onshore cable route;
- Onshore cable trenching and ducting – for the majority of the length of the cable route, an open cut trench and ducting method will be used to install the onshore cable;
- Construction of joint bays – joint bays will be constructed either using in-situ construction using reinforced concrete site walls or installation of pre-cast concrete construction;
- Cable pulling and jointing – the cable is supplied in pre-ordered lengths on large cable drums. The cable length on each drum is specific to the distance between joint bays with approximately 700 m lengths on each cable drum (see Figure 5-5 which shows a photo of a cable pulling procedure);
- Passing bays – at 16 locations along the onshore cable route, temporary traffic passing bays will be installed adjacent to joint bays to enable through traffic during the construction and cable installation at the JBs;
- Crossings – the onshore cable route will cross a number of obstacles along its route including the River Dee (twice), M1 motorway and Dublin to Belfast rail line, a number of watercourses and two gas pipelines. The use of horizontal directional drilling (HDD) methods is proposed for crossings of the main watercourses, the M1 motorway and Dublin to Belfast rail line as it allows installation of the onshore cable underneath the watercourse / obstacle thereby avoiding direct impact. Drains, ditches and the gas pipelines will be crossed using open trench methods;
- Following completion of cable pulling and jointing, the passing bays will be reinstated with the excavated soil, and the temporary stockproof fencing removed; and
- Permanent reinstatement of roads and grassland sections will be to the standard required and in accordance with the pre-application consultation with Louth County Council. For unsurfaced/grass sections, the trench will be reinstated with the excavated material to allow soil to be seeded. Hedgerows will be replanted.

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Figure 5-5: Photo of cable pulling procedure.

5.2.3 Onshore substation

The proposed onshore substation will contain equipment required to filter, monitor and control electricity received from the offshore wind farm. The substation will comprise of the following main elements:

The onshore substation will consist of three compounds: Compound 1 will contain Gas Insulated Switchgear (GIS) located inside a building (see figure 5-6). Compound 2 will contain outdoor Air Insulated Switchgear (AIS) and will form part of the transmission system for the offshore grid. The entrance compound, which will include a telecommunications building, standby diesel generator and car parking. The onshore substation equipment will be maintained by the Transmission Asset Owner (TAO) and operated by the Transmission System Operator (TSO).

Transmission cables from the GIS substation in Compound 1 will connect to the existing overhead power line through two new Line Cable Interface Masts (LCIM). An existing 220 kV ESB tower adjacent to the substation compounds will be replaced by the two LCIM towers to enable this connection.

5.2.4 Onshore substation construction

Prior to any construction taking place a number of pre-construction surveys will be required including biodiversity surveys, utility surveys and site investigations. The onshore substation will comprise of the following main construction activities:

- Site preparation and enabling activities – a temporary construction compound will be set up at the site in Stickillin. This compound will include site offices, stores, delivery, offloading areas, welfare facilities, parking areas and security accommodation. The drainage system for the construction phase will also be set up including sediment control measures;
- Entrance reconfiguration – this will involve the widening of the existing entrance off the N33 and re-grading of existing track to accommodate deliveries;
- Temporary construction compound and access road - The temporary construction compound and access road will be excavated to suitable formation level. Imported stone will then be placed, compacted and graded to form access road and compound area;
- Cable pulling temporary hardstand – engineering stone fill will be laid and compacted and maintained as required for the duration of the works. The cable drums/cable winch need a stable area due to their weight and ensure the cable is installed safely. This hardstand area may also be used for pulling the onshore cable to the LCIM's. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition;

- Demolition of existing ESB 220 kV Tower – this will involve the erection of temporary structures, which the existing overhead lines will be transferred to, in order to facilitate the decommissioning of the existing tower. It will also include the erection of two permanent LCIM's and reconnecting of OHL to new LCIM's;
- Substation compounds 1 and 2 will be marked. The topsoil will be stripped and stockpiled for later use in landscaping/construction activities. All remaining material excavated to achieve desired formation levels;
- Foundation works – this will commence once the groundworks have been completed to the required level. When the foundations have been set, the copper earth grid will be installed into the soil in and around the foundation and will cover the entire substation compounds;
- Erection of structural steelwork – this will occur at the GIS building in Compound 1, the control building in Compound 2, the statcom building and the telecommunications building;
- Cladding and building finishing works – these works will be undertaken once the structural frame and steel support structures are completed;
- Complete electrical installation – the electrical equipment will then be installed and tested in readiness for the connection of the offshore wind farm to the transmission grid;
- Commission and test plant – this will entail testing all substation equipment and documenting results to allow for back feed energisation;
- Once the construction of the onshore substation is complete, the site will be secured, and the supporting infrastructure finalised in readiness for the operational phase; and
- Temporary works reinstatement: The temporary access route, and the temporary construction areas around the LCIM's including the cable pulling temporary hardstand, will be reinstated as close as possible to their original condition in accordance with the relevant ESB/ IFA Code of Practice for Survey and in consultation with the landowner.

Figure 5-6: Photo of 220 kV GIS Substation Building.

5.3 Construction programme

A 33 month programme is proposed. The construction of the onshore infrastructure will take approximately 27 months and the offshore infrastructure will take approximately 15 months. Works on both the onshore and offshore infrastructure will overlap, but overall the construction will be 33 months. Should the Project receive consent, works would commence on the offshore infrastructure in quarter one 2027 and on the onshore infrastructure in quarter three 2025.

Hours of construction will take place from Monday to Saturday (inclusive) from 8:00am to 6:00pm. Specific activities may be required to take place outside of these hours.

5.3.1 Construction employment

The construction (and decommissioning) of the Project will require approximately 140 Full Time Equivalent (FTE) jobs to construct the onshore infrastructure and approximately 100 FTE jobs for the offshore infrastructure.

5.4 Operational and maintenance phase

The design life of the Project is 40 years. Operational and maintenance activities will be planned, controlled and monitored from an onshore operations and maintenance (O&M) base located at an existing harbour in County Louth or County Down. A CTV will be located at the port to transfer crews to the offshore wind farm area for operations and maintenance. The port will provide access for personnel onto the CTV and a harbour side crane for lifting tools and general spares onto the CTV. The CTV will in general operate during daylight hours with operations from 08:00 to 18:00. During winter, the vessels may leave and enter port during darkness.

30 operations and maintenance personnel will be based at the O&M base during routine periods of operations for the site. This number will increase depending on maintenance activities. The following offshore activities will take place over the lifetime of the Project:

- Routine operational activities;
- Routine inspections and seabed surveys;
- Repairs and replacements of navigational equipment;
- Painting of the foundation structures (above seawater level), wind turbines and offshore substation;
- Major component replacement (e.g. major foundation, offshore substation or wind turbine components);
- Cable repair or replacement; and
- Vessel activities (352 vessel return trips) to support the activities described above.

The onshore cable will be consistently monitored remotely by EirGrid. Routine maintenance activities at the onshore substation and along the onshore cable route will be required. These will involve visits to the onshore substation to check equipment. It is not expected that the TJB will need to be accessed during the operation of the Project, however link boxes and communications chambers will require inspection during the operational and maintenance phase. These chambers have manhole covers to allow for inspection.

5.5 Decommissioning phase

At the end of the operational lifetime of the Project, it is anticipated that all structures above the seabed or ground level will be completely removed.

The offshore decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.

It is expected that onshore cables would be removed by disconnecting each section at the joint bay and pulling them through the cable ducts. This operation would be a reverse of the installation operation and result in the same impacts.

The structures associated with the joint bays will be removed only if it is feasible with minimal environmental disturbance or if their removal is required to return the land to its former use.

The case for decommissioning the onshore substation will be reviewed in discussion with the TSO and the regulator in light of any other existing or proposed future use of the onshore substation. If complete decommissioning is required, then all of the electrical infrastructure will be removed, and any waste will be taken off site by a licenced waste contractor and managed in accordance with the waste hierarchy and where required to be disposed, this will be done under licence from the appropriate authority.

5.6 Environmental management

5.6.1 Measures included in the Project

As part of the project design process, a number of measures have been proposed to reduce the potential for impacts. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Project. These measures are considered standard industry practice for this type of development. These measures are presented in each of the assessments and are integrated into the description of the Project and have therefore been considered in the assessments presented in the EIAR. This is in line with EPA guidance which states that "*in an EIAR it may be useful to describe avoidance measures that have been integrated into the project proposal"* (EPA, 2022).

5.6.2 Management plans

The measures included in the Project include a number of management plans, which the Applicant is committed to implementing. These management plans are considered standard industry practice for offshore wind development. These management plans have been prepared to support the EIAR and are provided as appendices to chapter 5: Project Description. The management plans are listed below will be further developed prior to construction:

Appendix 5-1 Construction Environmental Management Plan (CEMP);

Appendix 5-2 Environmental Management Plan (EMP) (including Marine Pollution Contingency Plan);

Appendix 5-3 Marine Invasive Non-Native Species Management Plan (MINNSMP);

Appendix 5-4 Marine Mammal Mitigation Plan (MMMP);

Appendix 5-5 Marine Megafauna: Vessel Code of Conduct;

Appendix 5-6 Fisheries Management and Mitigation Strategy (FMMS);

Appendix 5-7 Emergency Response Co-operation Plan (ERCoP);

Appendix 5-8 Lighting and Marking Plan (LMP);

Appendix 5-9 Construction Traffic Management Plan (CTMP); and

Appendix 5-10 Marine Archaeological Management Plan (Marine AMP).

6 CONSULTATION

Throughout the development of the Project and as part of the preparation of the EIAR, an extensive stakeholder consultation process was undertaken. This included public consultation events and engagement with key statutory and non-statutory stakeholders. The core purpose of the consultation was to provide the public and stakeholders with information on the Project and to obtain information to inform the development of the Project and the EIAR.

Key public consultation events comprised:

- Appointment of a Community Liaison Officer and a Fisheries Liaison Officer;
- A project website (www.orielwindfarm.ie), including contact details for the Applicant, an option to receive regular email updates and details of alternative ways to engage on the project;
- Face-to-face public consultation events in 2023;
- Public online webinars in 2021 and 2023;
- Online exhibition of the Project on the Project website during 2021 and 2023;
- Engagement with public representatives;
- Community group meetings; and
- Engagement with local fisheries groups;

Consultation was undertaken with a wide range of stakeholders at the EIA scoping stage. This included issuing the EIAR scoping report (RPS, 2019) with a request for feedback on the proposed content of the EIAR and on the proposed assessment methodologies. Consultation was also undertaken with the departments and ministries in Northern Ireland, the UK and the Isle of Man regarding the potential for transboundary impacts from the Project.

During preparation of the EIAR, consultation continued with key stakeholders to obtain feedback on the Project and ensure the most up to date datasets were available to inform the baseline environment. Consultation which included providing a project update continued with key bodies from 2021 to 2024.

Feedback received during consultation has been reviewed by the project team. Much of the feedback and issues raised relate to the assessment of the Project and how it may impact on the community and the environment and what measures will be put in place to minimise/avoid impacts. As such, the feedback and issues raised have informed decision making by providing knowledge to the project team, which has been used to inform the EIAR and the specialist impact assessments.

Extensive engagement with organisations and groups representing the fishers that are active around the offshore wind farm area and offshore cable corridor has also been undertaken. The Applicant is also participating in the National Seafood Offshore Renewable Energy Forum as part of its membership in Industry Associations and is committed to adhering to the principles of engagement agreed by this forum.

Pre-application consultations with Louth county Council (LCC) and An Bord Pleanála (ABP) have also informed the development of the Project and the completion of assessments included in the EIAR.

An Bord Pleanála will conduct a statutory public consultation on the planning application, where the public can make submissions on the application for consideration by An Bord Pleanála as part of the decision-making process.

On lodgement of the application, a standalone website (www.orielwindfarm-marineplanning.ie) will be available for download of all application documents.

The Project website (www.orielwindfarm.ie) remains in place to provide updated information on the Project including an option to receive regular email updates, and details of alternative ways to engage on the Project.

7 ASSESSMENTS – MARINE RECEPTORS

The EIAR has assessed the potential for impacts to arise during the construction, operational and maintenance and decommissioning phases of the Project. This section provides a non-technical summary of the assessments undertaken on marine receptors for the Project. Further information on the assessments can be volume 2B of the EIAR.

To provide a complete non-technical summary on archaeology and cultural heritage, the cultural heritage assessment (included in volume 2C) and the marine archaeology assessment are presented together in section 7.11.

7.1 Marine Processes

Marine processes relate to the action of tidal currents, wave climate and sediment transport regimes. These are not receptors in themselves; however, they may provide a pathway for impacts on other receptors such as ecology receptors and designated sites.

The assessment on marine processes considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases. Numerical modelling techniques were used to describe tide, wave and sediment transport regimes and quantify the potential changes in baseline conditions. The model output was also used to inform assessments of the following: Benthic Subtidal and Intertidal Ecology, Fish and Shellfish Ecology, Marine Mammals and Megafauna, Infrastructure, Marine Recreation and Other Users.

The Marine Processes Study Area used for this assessment encompasses the offshore wind farm area, the offshore cable corridor plus a buffer of 20 km. The study area has an average tidal range of 3.5 m and is characterised by relatively weak tidal currents which flow to the northwest during flood tides and to the southeast during ebb tides. Depths range between approximately 15 m Chart Datum (CD) at the northwest deepening to approximately 33 m CD in the southeast of the offshore wind farm. The offshore wind farm area is sheltered from northerly winds and the associated waves however larger waves may reach the offshore wind farm area from the south due to a greater fetch within the Irish Sea.

Seabed sediments within the offshore wind farm area range from muddy sand to coarse gravel, with exposed rock outcrops at some locations. There is little evidence of significant sediment transport within this area with a lack of sand wave features although some sand waves are visible to the south of the offshore wind farm area.

The offshore cable corridor seabed sediment is comprised of finer seabed material with some areas of muddy sand. Marine processes at the landfall exhibit limited longshore transport due to the sheltering effect of Dunany Point to the north and Clogher Head to the south giving rise to lesser residual currents. However, the landfall location would be exposed to storm events approaching from the southeast. Potential impacts are largely related to sedimentation and re-suspension of material mobilised during the construction phase.

The potential impacts assessed include:

- Increased suspended sediment concentrations and associated deposition (all phases);
- Presence of infrastructure may lead to changes to tidal currents (operational and maintenance phase);
- Presence of infrastructure may lead to changes to wave climate and littoral currents (operational and maintenance phase); and
- Presence of infrastructure may lead to changes to waves and tidal currents, leading to changes in sediment transport (operational and maintenance phase).

The following measures are included in the Project to reduce the potential for adverse effects:

- Scour protection;
- Burial and protection of cables; and
- Use of trench reinstatement in the intertidal zone.

The increases in suspended sediment concentrations were seen to be temporary and of insignificant magnitude at the location of designated areas during offshore activities such as site preparation, inter-array cable installation and piling of turbine structures. The changes due to the presence of the infrastructure on

tides, waves or sediment transport was limited to the immediate vicinity of the Project and did not extend to any designated sites.

Increases in suspended sediment concentrations and associated deposition were overall deemed to have an effect of imperceptible adverse significance, which is not significant in EIA terms. Installation of drilled structures in the northeast of the offshore wind farm area indicate that on occasion sediment plumes extend to the mouth of Carlingford Lough during installation. However, concentrations are low and do not persist or result in discernible sedimentation. Similarly, sediment plumes originating from inter-array trenching activities do not extend to any of the designated sites.

The offshore cable installation does not affect any of the European designated sites. Plumes may reach the outer extent of Dundalk Bay SPA at the southern end of the Bay and maximum concentrations may reach those experienced during storm conditions on occasion, but typical values are far smaller and no discernible sedimentation persists following the installation. The offshore cable trenching route passes through the Dunany pNHA. However, the increased suspended sediment concentrations will have little significance as this area is designated for the presence of stony shoreline and clay cliffs which are not sensitive to these impacts. Furthermore, sedimented material is native material that is redeposited within the area following suspension. Part of the offshore cable also passes through the North-west Irish Sea cSPA. Modelling of the cable installation has shown that the sediment plume will only persist for a maximum period of two to three hours in any location as the cable is continuously installed along its length.

Cumulative impacts were considered in relation to increased suspended sediment concentrations and associated deposition. The project considered was the proposed North Irish Sea Array (NISA) offshore wind farm. Should NISA take place concurrently with Project construction, operation and maintenance or decommissioning activities, there is potential for cumulative increased turbidity levels. However, given the existing distance between the Project and the proposed NISA site, as well as the extents of the Project modelled sediment plumes on the southern boundary of the offshore area, the potential for interaction is likely to be limited. All other receptors are unaffected. The cumulative effect will, therefore, be of imperceptible significance, which is not significant in EIA terms.

The border between Ireland and Northern Ireland (UK) lies within the study area considered for this assessment. In relation to transboundary effects, changes to hydrography as a result of the Project do not extend to the border with Northern Ireland and therefore there is minimal potential for transboundary impacts to physical processes, including tidal and littoral currents, wave climate and therefore marine water quality.

Overall the assessment concluded that the Project will not result in any significant residual effects on marine processes following the implementation of the measures included in the Project.

7.1.1 Marine water quality

This assessment also examined the potential impact of pollution caused by accidental spills and contaminants. A Water Framework Directive Assessment was also completed to support the assessment on marine water quality. With the implementation of the following plans, the Project will result in slight residual effects (not significant in EIA terms) on marine water quality:

- Environmental Management Plan (EMP);
- Marine Invasive Non-Indigenous Species Management Plan;
- Marine Pollution Contingency Plan (MPCP);
- Emergency Response Co-operation Plan; and
- Construction Environmental Management Plan (CEMP).

7.2 Benthic Subtidal and Intertidal Ecology

Benthic ecology refers to the communities of animals and plants which live on or in the seabed and the relationships that they have with each other and with the physical environment. The benthic subtidal (i.e. the area below the low tide mark) and intertidal ecology (area between high tide and low tide mark) assessment considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases.

The benthic ecology was characterised using a desk top study and site-specific surveys. The Benthic Subtidal and Intertidal Ecology Study Area encompasses the offshore wind farm area, the offshore cable corridor plus a buffer of 10 km.

A number of important ecological features (IEFs) in the Benthic Subtidal and Intertidal Ecology Study Area were assessed. These included subtidal sandy mud sediment (which supports a variety of brittle stars and bivalves), subtidal coarse sediments (which supported a variety of marine worms and bivalves), subtidal infralittoral rock and Annex I estuaries, Annex I Mudflats and sandflats not covered by seawater at low tide.

The potential impacts assessed include:

- Temporary subtidal habitat loss/disturbance (all phases);
- Temporary intertidal habitat loss/disturbance (all phases);
- Increased suspended sediment concentrations and associated sediment deposition (all phases);
- Seabed disturbance leading to the potential release of sediment contaminants and resulting potential effects on benthic ecology (all phases);
- Long-term subtidal habitat loss (operational and maintenance phase);
- Colonisation of foundations, scour protection and cable protection (operational and maintenance phase);
- Alteration of seabed habitats arising from effects of physical processes (operational and maintenance phase); and
- Increased risk of introduction and spread of invasive and non-native species (all phases).

The following measures are included in the Project to reduce the potential for adverse effects:

- Implementation of an EMP;
- A pre-construction survey: Although no reefs were found within the offshore wind farm area or offshore cable corridor in the 2006 or 2019 surveys, a pre-construction survey will be undertaken within the offshore wind farm area and offshore cable corridor to identify any areas of reef habitat;
- Implementation of a Marine Invasive Non-Indigenous Species Management Plan (MINISMP);
- Burial and protections of cables; and
- Reinstatement of rock in the intertidal zone following cable installation.

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with effects ranging from imperceptible to slight adverse significance. This was due to the limited extent of the effects on the extensive receptors (species, communities and habitats) and the short term and/or reversible nature of the effects.

The potential for cumulative impacts was considered with the proposed North Irish Sea Array (NISA) offshore wind farm project. The potential for the NISA project to result in cumulative impacts with the above impacts (excluding temporary intertidal habitat loss/disturbance) was considered. Overall, it was concluded that there will be no significant cumulative effects arising from the Project.

Potential transboundary impacts have been identified in relation to the potential impact from the risk of introduction and spread of Invasive Non-Indigenous Species (INIS) to Northern Ireland. Overall, it is concluded that there will be no significant transboundary effects arising from the Project.

Overall the assessment concluded that the Project will not result in any significant residual effects on benthic subtidal and intertidal ecology with the implementation of the measures included in the Project.

7.3 Fish and Shellfish Ecology

The assessment for fish and shellfish ecology considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases.

An evidence-based approach has been used to inform the assessment on fish and shellfish ecology within the identified study area. Two study areas were identified to inform the fish and shellfish ecology receptors, namely, the Fish and Shellfish Ecology Study Area (the area encompassing the offshore wind farm area, the

offshore cable corridor, and the area in the immediate vicinity of the intertidal area) and a wider Western Irish Sea Study area (includes the western portion of the Irish Sea along the east coast of Ireland, from Ballyquintin Point to Carnsore Point). Within each study area the distribution and abundance of key species, spawning and nursery activity, commercial and conservation importance, migratory species and species of ecological importance (e.g. important prey species for other marine species, including other fish species) were identified.

A detailed baseline characterisation of fish and shellfish receptors within each study area was collected via a desktop study. The desktop review found the species assemblage of the Fish and Shellfish Ecology Study Area to be typical for this region of the western Irish Sea. The key characterising fish species consisted of a mix of both pelagic and demersal species, including plaice, cod, haddock, whiting, sprat, mackerel, herring and sandeel. Many of these species are fished commercially within the Western Irish Sea Fish and Shellfish Ecology Study Area, as are shellfish species such as European lobster and Norwegian lobster. Low intensity[3] spawning and nursery grounds were identified within the Fish and Shellfish Ecology Study Area. A number of migratory fish species also have the potential to occur in the Western Irish Sea Fish and Shellfish Ecology Study Area, including six species listed as features of Special Areas of Conservation (SACs) / Sites of Community Importance (SCIs) in Ireland and other European Economic Area (EEA) states. Features of SACs are listed habitat types and species that are considered to be most in need of conservation at a European level as defined by the Habitats Directive. SCIs are sites that were adopted by the European Commission before the end of the Transition Period following the UK's exit from the EU, but not yet formally designated by the government of each country. The 'Ecological sensitivity analysis of the western Irish Sea to inform future designation of Marine Protected Areas (MPAs)' report released by DHLGH identified herring spawning ground at the Mourne area as a potential feature for a proposed MPA.

The potential impacts assessed include:

- Temporary subtidal and intertidal habitat loss/disturbance (all phases);
- Injury and/or disturbance to fish from underwater noise during pile-driving (construction phase);
- Increased suspended sediment and associated sediment deposition (all phases);
- Long-term subtidal habitat loss (operational and maintenance phase); and
- The impact of electromagnetic fields from subsea electrical cabling (operational and maintenance phase).

The following measures are included in the Project to reduce the potential for adverse effects:

- Implementation of an EMP;
- Burial and protection of cables; and
- During piling operations, soft starts will be used, with lower hammer energies used at the beginning of the piling sequence before increasing energies to the higher levels.

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with effects ranging from slight to imperceptible adverse significance.

Subject to discussion with relevant stakeholders, the Applicant is proposing to undertake surveys for adult herring and implement an initiative to aid herring spawning population such as oyster beds (shells are used for laying eggs on) within final design of cable protection and scour protection.

Cumulative impacts were considered in relation to injury and/or disturbance to fish from underwater noise during pile-driving activities associated with installation of the turbine foundations. Projects considered included North Irish Sea Array (NISA), Dublin Array, Codling Wind Park, and Arklow Bank Wind Park. Overall, it was concluded that there will be no significant cumulative effects arising from the Project.

The Western Irish Sea Fish and Shellfish Ecology Study Area in the western portion of the Irish Sea extends to Ballyquintin Point in Co. Down (Northern Ireland). This area was defined to assess the likely significant effects which may extend beyond the project boundary (e.g. injury and/or disturbance to fish from underwater

[3] Nursery and spawning habitats were categorised by as either high or low intensity dependent on the level of spawning activity or abundance of juveniles recorded.

noise during pile-driving) and also to account for the highly mobile nature of some fish and shellfish species, in particular diadromous fish species. As no significant effects are predicted, there is no potential for significant transboundary effects with regard to fish and shellfish ecology from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on fish and shellfish ecology with the implementation of the measures included in the Project.

7.4 Marine Mammals and Megafauna

The assessment on marine mammals and megafauna considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phase.

An evidence-based approach was used to inform the assessment on marine mammal (whales, dolphins, porpoises and seals) and megafauna (basking shark and sea turtles) receptors within the Marine Mammal and Megafauna Study Area. The study area encompasses the offshore wind farm area, offshore cable corridor plus an appropriate buffer and is the area within which site-specific marine mammal and megafauna surveys were undertaken. A Regional Marine Mammal and Megafauna Study Area was also defined to provide a wider context for these species which may range over very large distances.

A detailed baseline characterisation of the marine mammals and megafauna was collected via a desk-top study and site-specific surveys. Various site-specific surveys were carried out within the offshore wind farm area and offshore cable corridor. These included boat-based transect surveys both in 2006 and between 2018 and 2020 and digital aerial surveys flown over the same transects during a six-month period (spring-summer) in 2020. Boat-based and aerial surveys recorded sightings of species throughout the Marine Mammal and Megafauna Study Area were used to derive density and abundance estimates. In addition, Static Acoustic Monitoring surveys were conducted over 12 months between 2019 to 2020 to record daily logs of echolocating marine mammals to estimate the frequency of site usage. The desk-top study and site-specific survey data determined the key marine mammal and megafauna species in the study area as: harbour porpoise, short-beaked common dolphin, bottlenose dolphin, minke whale, grey seal, harbour seal, basking shark and leatherback turtle. All these species are protected under international legislation; harbour porpoise, bottlenose dolphin, grey seal and harbour seal, and are designated features of Special Areas of Conservation (SACs) within the Irish Sea.

The potential impacts assessed include:

- Injury and/or disturbance to marine megafauna from underwater noise and vibration during pile-driving (construction phase);
- Injury and/or disturbance to marine megafauna from elevated underwater noise during routine geophysical surveys (operational and maintenance phase);
- Injury and/or disturbance to marine megafauna from vessels and other construction activities (resulting from increased noise and collision risk) (all phases);
- Changes in the fish and shellfish community affecting marine megafauna prey resources (all phases); and
- Changes in electromagnetic fields (EMF) from subsea electrical cabling (basking shark only) (operational and maintenance phase).

The following measures are included in the Project to reduce the potential for adverse effects:

- Implementation of an EMP and MPCP;
- Implementation of a Marine Megafauna Mitigation Plan (MMMP) and a Vessel Code of Conduct during all phases. The MMMP sets out the measures to apply in advance of and during piling activity, including the implementation of a mitigation zone, and monitoring by Marine Mammal Observers and Passive Acoustic Monitoring;
- During piling operations, soft starts will be used, following NPWS (2014) guidelines. This will involve the implementation of lower hammer energies (i.e. approximately 10-15% of the maximum hammer energy) at the beginning of the piling sequence before energy input is ‘ramped up’ (increased) over time to required higher levels (also known as a soft-start); and

- Burial and protection of cables - cables will be buried below the seabed wherever possible, to a minimum burial depth of 0.5 m and a maximum burial depth of 3 m to reduce the potential for EMF on basking shark and other sensitive species.

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with effects ranging from imperceptible to slight.

In addition to the measures included in the Project, an Acoustic Deterrent Device (ADD) which has been shown to be effective in deterring marine mammals from proximity to piling will be implemented as part of the MMMP. Furthermore, a Piling Strategy which sets out the final Project design as well as options for potential management measures will be implemented as part of the MMMP.

The potential for cumulative impacts was considered with a number of other offshore wind farm projects in the Irish Sea and proposed site investigation surveys. The cumulative impacts assessed include:

- Injury/disturbance from underwater noise during pile driving (construction phase);
- Injury/disturbance from elevated underwater noise during routine geophysical surveys (operational and maintenance phase); and
- Injury/disturbance from vessel activity (all phases).

Impacts were not predicted to have any significant effects on marine mammal, basking shark or leatherback turtle populations. Overall, it was concluded that there will be no significant cumulative effects arising from the Project.

The Applicant commits to implementing phased piling alongside other adjacent offshore wind farms in the western Irish Sea as part of a Piling Strategy. This strategy will be prepared post consent and will set out measures for collaboration with other projects to reduce the potential for an in-combination effect.

The Regional Marine Mammal and Megafauna Study Area covers the Irish Sea and therefore extends to the coastlines of Northern Ireland, Scotland, England and Wales. This area was defined to assess the likely significant effects which may extend beyond the Marine Megafauna Study Area (e.g. subsea noise) and to account for marine mammals, basking shark and sea turtles, which are highly mobile and may range over large distances. As no significant effects are predicted, there is no potential for significant transboundary effects with regard to marine mammals and megafauna from the Project upon the interests of the UK and other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on marine mammals and megafauna with the implementation of the measures outlined above.

7.5 Offshore Ornithology

Offshore ornithology refers to the study of populations of birds found in the marine environment, including seabirds, seaducks and divers. These species typically spend the majority of their life cycle at sea, using onshore habitats only to breed and rest. The offshore ornithology assessment also considers the migratory species that may cross the sea in the vicinity of the Project site.

The offshore ornithology for the Project was characterised using a desk-top study and site-specific surveys. The site-specific surveys were carried out in the Offshore Ornithology Study Area which comprised the offshore wind farm area and a buffer extending between approximately 3.6 km to 12.7 km around it. Surveys in this area included boat-based transect surveys between 2006 – 2008 and between 2018 – 2020, followed by digital aerial surveys flown over the same transects during a six-month period (spring-summer) in 2020. Standard analytical techniques were used to estimate the densities of birds in study area. The desk top study examined data sources for the wider area, providing contextual information about seabird densities within the Irish Sea, as well as providing details about regional breeding and non-breeding populations.

The desk-top study and site-specific data determined the key bird species in the study area as: Manx shearwater, gannet, kittiwake, guillemot, razorbill, great northern diver, common gull, great black-backed gull and herring gull with their populations varying seasonally. These species are all protected in Irish and British waters through designation within a number of Special Protection Areas (SPAs).

The potential impacts assessed include:

- The direct impacts of disturbance and displacement associated with construction and decommissioning activities or the presence and operation of the turbines;
- Indirect displacement resulting from changes to prey and habitats (all phases);
- Collision risk to birds flying through or within the offshore wind farm; and
- Barrier to the movement of birds. The indirect impacts through changes to prey species were also considered.

The following measures are included in the Project to reduce the potential for adverse effects:

- An EMP will be implemented during the construction, operational and maintenance, and decommissioning phases of the Project. The EMP will include an MPCP and a plan for minimising disturbance to rafting seabirds from construction vessels.

Disturbance and displacement as a result of construction or decommissioning activities was considered for guillemot, razorbill and great northern diver. Due to the localised and temporary nature of the activities and the small number of birds affected as a result, impacts were assessed as imperceptible or slight adverse significance, which is not significant in EIA terms.

During the operational phase of the Project, the impact of disturbance and displacement functions over a larger area and longer duration for the lifetime of the Project. The number of birds affected is higher than during the construction or decommissioning phases. The potential for long-term displacement to affect gannet, great northern diver, guillemot, and razorbill was assessed as negligible and of slight adverse significance. Displacement of great northern diver was deemed to be of slight to moderate adverse significance, which is not significant in EIA terms.

The spinning turbine rotors present a risk of collision to birds flying through or within the offshore wind farm area. Many seabird species, such as Manx shearwater, auks and fulmar tend to fly very low above the sea surface and are rarely at risk. Other species such as gannet and gulls frequently fly at the height of the spinning rotors and are more at risk of collision. The risk of collision as a result of the Project was assessed for gannet, kittiwake, common gull, herring gull and great black-backed gull. In the context of additional mortality in their regional populations, the impacts were predicted to be of slight adverse significance, which is not significant in EIA terms.

Barrier effects may arise in addition to displacement however, unlike displacement, the effect refers to the disruption of preferred flight lines, so that birds are forced to navigate around an obstacle using alternative routes, which then imposes an additional energetic cost to daily movements (particularly during the breeding season) or migratory routes. The Project is within the mean maximum foraging range of several breeding colonies of gannet, kittiwake, guillemot and razorbill and could therefore be at risk of a barrier effect. However, the offshore wind farm area is unlikely to form a significant part of these species' foraging grounds. Overall, the effect was assessed as imperceptible to slight or moderate adverse significance which is not significant in EIA terms.

Indirect displacement resulting from changes to prey and habitats were assessed as imperceptible to slight for all seabirds.

The Project proposes to continue monitoring the population distribution and abundance of the Offshore Ornithology Study Area. This monitoring is proposed to consist of digital aerial surveys before construction (Year 0) and Years 1, 3, 5 and 15 following construction, following the same scope, methods and analysis of the baseline surveys.

Cumulative impacts on offshore ornithology from the Project together with other offshore wind farm and marine developments within approximately 500 km were assessed. The cumulative impacts assessed include:

- Disturbance and displacement; and
- Collision risk.

The impacts were predicted to be of slight adverse significance which is not significant in EIA terms.

The Cumulative Offshore Ornithology Study Area extents to approximately 500 km and therefore includes the jurisdictions of Northern Ireland, Isle of Man, England, Scotland and Wales. As the potential cumulative impacts were assessed to be not significant, there is no potential for significant transboundary effects with regard to offshore ornithology.

Overall the assessment concluded that the Project will not result in any significant residual effects on offshore ornithology with the implementation of the measures outlined above.

7.6 Commercial Fisheries

Commercially important species are those fish and shellfish species specifically targeted, caught and sold for profit. The assessment for commercial fisheries considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases. An evidence-based approach was used to inform the environmental impact assessment on commercial fisheries receptors within the identified study area.

The Commercial Fisheries Study Area encompasses International Council for the Exploration of the Sea (ICES) Rectangle 36E3 which includes the offshore wind farm area, offshore cable and waters in the vicinity of the Project. A wider Regional Study Area defined as ICES rectangles 36E3, 37E3, 36E4 and 37E4 was used to provide a further examination of fishing trends within waters which commercial fisheries receptors may operate.

A detailed baseline characterisation of the Commercial Fisheries Study Area was collected using a desktop study of fisheries data available within the public domain and through consultation with key fisheries stakeholders. Information on Commercial Fisheries within the Commercial Fisheries Study Area included data from the Republic of Ireland and the UK. Key datasets included the Atlas of Commercial Fisheries around Ireland and fisheries data available from Irelands Marine Atlas available from the Marine Institute, effort and landings data from the European Union Data Collection Framework, landings data from the Sea Fisheries Protection Agency and landings and effort data from the Marine Management Organisation in the UK.

The potential impacts assessed include:

- Displacement of fishing activity (all phases);
- Potential changes to fishing activity due to presence of infrastructure (operational and maintenance phase);
- Potential for snagging of gear (operational and maintenance phase); and
- Reduction in available seabed due to the presence of infrastructure (operational and maintenance phase).

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with effects ranging from imperceptible to slight adverse significance. This was due to the limited extent of the effects on the widespread receptors and the localised, short term and reversable nature of the majority of effects and the implementation of measures to ensure disruption to fishing activity is minimised.

The following measures are included in the Project to reduce the potential for adverse effects:

- Notification of works and ongoing liaison with all fishing fleets via Notices to mariners;
- Use of guard vessels where appropriate;
- Implementation of Aids to Navigation (marking and lighting) (including temporary Aids to Navigation on any partially constructed turbines);
- Implementation of advisory marine safety zones of 500 m; and
- Implementation of Fisheries Management and Mitigation Strategy (FMMS).

The potential for cumulative impacts displacement of fishing activity was considered with the North Irish Sea Array (NISA); Dublin Array and Codling Wind Park offshore wind farm projects in the Irish Sea. The spatial extent of any potential impacts from each project will be relatively small in the context of the available commercial fishing areas in the western Irish Sea. Overall, it is concluded that there will be no significant cumulative effects from the Project alongside the other projects due to the localised and short term nature of any effects and the distances between each of the projects considered.

Transboundary impacts are limited to potential displacement of fishing effort from the Project into the UK EEZ, namely the Northern Ireland EEZ. Based on the established fishing grounds targeted by the fleets under assessment and the available fishing grounds in the wider regional study area it is not anticipated that

displacement effects into the Northern Ireland EEZ would be significant. As all effects assessed were found to have no more than a slight adverse significance of effect, no further mitigation measures are deemed to be required.

Overall the assessment concluded that the Project will not result in any significant residual effects on commercial fisheries with the implementation of the measures outlined above.

7.7 Shipping and Navigation

The assessment on shipping and navigation considered the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases. Shipping and navigation encompasses the full range of vessel types.

This assessment addresses navigational safety and risk to all vessel types including commercial, fishing and recreational vessels.

The baseline environment for shipping and navigation was characterised by carrying out a detailed desktop review of existing studies and datasets.

This desktop study reviewed the primary navigational features for the shipping and navigation study area including coastal features, metocean conditions, local ports, vessel traffic management as well as search and rescue provision. Vessel traffic analysis using data for January and July in 2019 and 2022 indicated a generally low level of vessel traffic transiting through the offshore wind farm area. From the data there is evidence of some commercial traffic transiting between Carlingford Lough to and from Drogheda Port however, the majority of cargo vessel traffic passes clear of the offshore wind farm area. The level of tanker traffic transiting through the shipping and navigation study area is minimal, with none passing through the offshore wind farm area. The data suggests that fishing activity is principally outside and to the south and south-east of the project area; however, several fishing vessels transit across the study area to and from their fishing grounds. Recreational craft transit north and south to and from Carlingford Lough through the study area. Historical marine incidents from the Marine Casualty Investigation Board and the Royal National Lifeboat Institution were reviewed which indicated that a significant majority of incidents in the area involved fishing vessels and recreational craft.

The potential impacts assessed for all phases include:

- Presence of project-related vessels transiting to and from their marshalling harbour and O&M operational base, and displacement of vessels from the offshore wind farm area, may lead to vessel-to-vessel collision (all phases);
- Presence of Project devices may lead to vessel-to-structure contact (all phases); and
- Presence of Project devices and cables underwater may lead to snagging and damage to anchors and/or fishing gear (all phases).

The following measures are included in the Project to reduce the potential for adverse effects:

- Promulgation of information and warnings through Notice to Mariners and other appropriate Maritime Safety Information dissemination methods;
- Provision of continuous watch by multi-channel Very High Frequency, including Digital Selective Calling, in order to identify potential navigational hazards;
- Advisory marine safety zones of 500 m radius to be implemented around WTGs and other offshore infrastructure undergoing construction/decommissioning or major maintenance activities;
- A rolling advisory clearance distance of 500 m in radius to be implemented around the cable laying vessel;
- Lighting and Marking Plan has been prepared and will be agreed with the MSO, IAA, IRCG and CIL prior to construction;
- The Project to undertake vessel traffic monitoring with all Project-related vessels throughout all phases;
- An Emergency Response Co-operation Plan has been prepared and will be agreed with the IRCG and other key stakeholders;

- A Navigation Safety Management System to collate documents for management of navigational safety relevant to the marine activities from multiple sources. This includes documents created by the Project and those in place for third parties such as construction and maintenance contractors;
- Provision of a guard vessel to monitor third party vessel traffic and intervene with safety warnings, as necessary;
- A cable burial risk assessment will be conducted which will ensure cables are adequately buried so as not to become a navigation hazard;
- Compliance with IMO Conventions including the International Regulations for Preventing Collisions at Sea and the International Convention for Safety Of Life At Sea;
- Production of a Fisheries Management and Mitigation Strategy;
- WTG blade air draught clearance of at least 22 m above Mean High Water Springs (MHWS);
- Charting of offshore structures, inter-array cables and offshore cable and landfall infrastructure on navigation charts;
- Inform UKHO and the Kingfisher Information Services Cable Awareness; and
- Provide information on the lines of WTG orientation with IRCG.

Vessel-to-vessel collision was deemed to be of slight adverse significance, which is not significant in EIA terms, for all vessel types due to the low density of vessel activity in the project area and the implementation of standard industry practices including Aids to Navigation.

Vessel collision with Project structures was deemed to be of slight adverse significance, which is not significant in EIA terms, for all vessel types due to the proposed use of guard vessels, safety zones, marker buoys and/or other Aids to Navigation which will be deployed on a device-specific basis.

Snagging and damage to anchors and/or fishing gear on offshore project structures (particularly cables) was deemed to be of slight adverse significance, which is not significant in EIA terms, for all vessel types as cables will be buried in the seabed where possible to a minimum burial depth of 0.5 m and will be marked on navigation charts.

Cumulative impacts from site investigation works and the NISA offshore wind farm project were assessed and predicted to result in effects of slight adverse significance (not significant in EIA terms) upon shipping and navigation.

Due to the international nature of shipping and navigation activity, transboundary effects are an integral part of the EIA and supporting Navigation Risk Assessment and so are considered as part of the assessments summarised above. Overall there is no potential for significant transboundary effects with regard to shipping and navigation from the Project upon the interests of the UK and EEA states.

Overall the assessment concluded that the Project will not result in any significant residual effects on shipping and navigation following the implementation of the measures included in the Project.

7.8 Aviation, Military and Communications

An assessment of the impact of the Project on existing aviation, military and communications receptors within the vicinity of the Project was undertaken. The assessment examined the potential impact of the Project during the construction, operational and maintenance, and decommissioning phases.

Information on aviation, military and communications receptors was collected through a detailed desktop review and consultation with the relevant aviation and communications stakeholders. The desk-top review was carried out within an Aviation, Military and Communications Study Area. In particular, line of sight analysis was undertaken to assess potential impacts on aviation radar and microwave, Very High Frequency and Ultra High Frequency links were assessed within 1 km of the offshore wind farm area. No site-specific surveys were undertaken as the baseline characterisation developed through existing data sources and consultation with relevant stakeholders was considered sufficient.

The Aviation, Military and Communications Study Area encompasses the offshore wind farm area and offshore cable corridor, as well as all areas within the zone of potential impact on air traffic control radars on the east coast of Ireland, Northern Ireland and the Isle of Man, military exercise areas and emergency helicopter operations in the event of life-critical Search and Rescue missions within the offshore wind farm

area. The offshore wind farm area is located entirely in Irish airspace within the Shannon Flight Information Region.

Regarding military operations, the nearest Department of Defence aerodrome to the offshore wind farm area is the Casement Aerodrome and the nearest military exercise and training area is the Gormanston Military Aerial Firing Range. There are several civil airports in proximity to the offshore wind farm area, including Dublin Airport (51 km south-southwest), Belfast City Airport and Belfast International Airport (75 km north-northeast and 78 km north-northwest respectively). There are presently no helicopter routes or offshore helicopter destinations in the vicinity of the offshore wind farm area. The east coast is popular for hand gliding and paragliding, although there are no sites listed for glider flying and hand gliding are within the vicinity of the Project.

There are three Primary Surveillance Radar in Ireland located at Cork, Dublin and Shannon airports, with the nearest to the offshore wind farm area located at Dublin Airport. The nearest Secondary Surveillance Radars is also located at Dublin Airport.

All navigation aids are located on land and outside the relevant safeguarding distances. There are no Air Defence, or Air Traffic Control radars that could have line of sight to the Project. No meteorological radar has been identified within 30 km of the offshore wind farm area. Communication devices such as UHF and microwave links have been identified in the vicinity of the Project, although none located within 1 km. The Kippure transmitter is the transmitter most likely to be affected as its transmissions pass over the wind turbines.

The potential impacts assessed included:

- Cable installation activities (construction phase) at the landfall that may restrict hang gliding and paragliding activities; and
- That the presence of wind turbines may interfere with television signals.

All other potential impacts on aviation and military from the Project were scoped out from the assessment due to their limited potential for impact.

The following measures are included in the Project to reduce the potential for adverse effects:

- All significant peripheral structures, to the highest point of the structure, will be fitted with high intensity warning lighting.
- Implementation of a Lighting and Marking Plan (LMP) setting out specific requirements in terms of aviation lighting to be installed on the turbines. The LMP will be prepared in consultation with the IAA, Department of Defence and IRCG;
- Continued consultation with the IAA, Department of Defence and the IRCG during all phases of the Project on lighting and SAR corridors;
- Implementation of an Emergency Response and Cooperation Plan; and
- Promulgation of information advising on the nature, timings and location of construction and decommissioning activities at the landfall location. Information and notices will be posted at the landfall location; and

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with any effects being assessed as imperceptible to slight adverse. This was due to the limited extent of the effects on the relevant receptors (hang gliding and paragliding activities at the landfall and interference with television signals) and the localised, short to medium term and reversable nature of the effects.

The potential for wind turbines to interfere with television signals was deemed to be of slight adverse significance (not significant in EIA terms). There is potential for the Project wind turbines to block the television signal for viewers along a localised coastal stretch of Northern Ireland, approximately between Ballymartin and Newcastle, and between Dundrum and Kilclief. The affected areas are mainly rural in nature, and 2RN anticipate that the number of potential viewers affected would be low.

To mitigate potential effects on television services for households in coastal areas of Northern Ireland, the applicant will carry out a survey prior to construction to confirm the number of households potentially affected by interference to television signals, and further discussions will take place with 2RN to agree mitigation if required.

No other projects were considered to result in cumulative impacts on aviation, military and communication receptors with the Project.

Potential transboundary impacts have been identified in relation to the potential for impact upon broadcast television services for viewers in Northern Ireland. Overall, it was concluded that there will be no significant transboundary effects arising from the Project.

Overall, the assessment concluded that the Project will not result in any significant residual effects on aviation, military and communications following the implementation of the measures included in the Project.

7.9 Archaeology and Cultural Heritage

A marine archaeology assessment was completed to understand the potential impacts of the Project on archaeology below the Low Water Mark (LWM). A separate assessment was completed to assess the potential impact of the Project on cultural heritage sites above the LWM. The sections below provide a summary of these two assessments.

7.9.1 Marine archaeology

The subtidal and intertidal marine archaeology was characterised using a desktop study and site-specific surveys. The Marine Archaeology Study Area was defined as the area encompassing the offshore wind farm area, the offshore cable corridor and a wider search area encompassing 2 km from the offshore wind farm area and offshore cable corridor boundaries, up to the Low Water Mark.

The Marine Archaeology Study Area has the potential for as yet to be discovered archaeological remains of local to national interest (palaeolandscapes and wrecks). There are two known wreck sites located within the offshore cable corridor which are protected by the National Monuments Act. In addition, a geophysical survey assessment has recorded a number of anomalies within the offshore wind farm area which are, as yet, of unknown importance and it is possible that these anomalies could represent materials from wreck sites of considerable age. However, they may represent modern debris of no archaeological interest or they may be of natural origin.

The potential impacts assessed include:

- Removal or disturbance of seabed sediments leading to effects on prehistoric land surfaces and wreck sites and artefacts (all phases);
- Removal or disturbance of deeply buried sediments leading to effects on prehistoric land surfaces (construction phase);
- Disturbance of sediment causing sediment deposition on the seabed resulting in potential effects on archaeological receptors (all phases); and
- Alteration of sediment transport regimes (operational and maintenance phase).

The following measures are included in the Project to reduce the potential for adverse effects:

- Marine archaeologists to be consulted in the preparation of any pre-construction and site preparation activities;
- Identification and implementation of Archaeological Exclusion Zones (AEZs);
- All anomalies of unconfirmed archaeological potential to be taken into account during final design. If they are likely to be impacted, these anomalies would undergo further archaeological investigation. Should these anomalies prove to be of archaeological importance then future AEZs or temporary AEZs may be implemented following consultation with NMS;
- Implementation of a Marine Archaeological Management Plan including an Outline Written Scheme of Investigation and Protocol for Archaeological Discoveries;
- Commitment to the ongoing monitoring of known archaeological receptors through the acquisition of relevant spatial survey data; and
- Mitigation of unavoidable direct impacts through preservation by record or stabilisation.

Overall, it was concluded that there will be no significant effects arising from the Project during the construction, operational and maintenance or decommissioning phases with any effects being assessed as minor adverse. Therefore, no further mitigation measures were considered necessary.

No other projects were considered to result in cumulative impacts on marine archaeology with the Project.

The Marine Archaeology Study Area lies outside Northern Ireland territorial waters and the Project is considered unlikely to affect known and potential receptors that lie within these waters. Overall, it was concluded that there will be no significant transboundary effects arising from the Project.

Overall the assessment concluded that the Project will not result in any significant residual effects on marine archaeology following the implementation of the measures included in the Project.

7.9.2 Cultural Heritage

The cultural heritage assessment, encompassing archaeological heritage, architectural heritage and cultural heritage was based on a desk-study comprising a detailed documentary and cartographical review, and a field inspection.

To understand and to characterise the character, context and significance of the cultural heritage landscape, the baseline desk study took account of all designated archaeological and architectural heritage sites within a 1 km radius from the onshore infrastructure of the Project. The historical background indicates that the Cultural Heritage Study Area is in a landscape that is layered with a rich history of occupation since prehistoric times right up to the present day.

There are no protected structures (RPS sites) or NIAH sites within 100 m of the onshore substation site or the landfall location. The onshore cable route will for the most part run along the existing public road and therefore will not impact on private boundaries or properties associated with RPS sites, National Inventory of Architectural Heritage (NIAH) sites or undesignated roadside cultural heritage features identified during the course of the present assessment.

The potential impacts assessed during the construction phaseinclude:

- Construction activities with potential to impact Areas of Archaeological Potential;
- Construction activities within the onshore substation site that may impact on features identified in the geophysical survey and test excavation; and
- Construction activities that may impact on as yet unrecorded subsurface features and may impact on cultural heritage features or in previously undisturbed greenfield areas.

Effects of the operation of the offshore wind farm and onshore substation on the setting of cultural heritage sites were also assessed.

The following measures are included in the Project to reduce the potential for impacts on cultural heritage:

- The construction team will be made aware of the locations of those upstanding structures that are designated RPS / NIAH sites and the cultural heritage sites situated in the immediate vicinity of the onshore cable route;
- A photographic and written record of the impacted section of the rubble stone wall at Drumcar will be made. The impacted section of the wall will be rebuilt using traditional methods and the same materials subject to agreement and any other requirements as may be agreed with the planning authority prior to the commencement of construction;
- A section of woodland shelterbelt associated with the former Drumcar Demesne will be impacted. Replanting to restore any breach in the wooded shelterbelt with similar trees will be undertaken where feasible;
- The location of the boulder known as the ‘Mad Chair of Dunany’ on Dunany beach (located outside the planning application boundary) will be made known to the construction team.
- An exclusion zone (i.e. where no construction or earthmoving works will take place) of >5 m from the southern walled/hedgerow boundary of Dunany Demesne will be maintained during construction; and
- No works will be carried out that will damage the boundary wall of Dunany Demesne. The proposed permanent access track to TJB (Option 2) will be installed 5 m away from the Dunany Demesne wall to ensure no impact on this feature.

Construction activities within the onshore cable route were deemed to be of slight significance (on three areas of archaeological potential (at Dunany Demesne and Beach; Port/Boycetown and in Greenfield sites), and moderate significance (at Clonmore and Drumcar). Construction activities within the onshore substation site were deemed to be of moderate significance. Construction activities associated with previously undisturbed greenfield areas were deemed to be of slight significance. Operational and maintenance phase setting impacts associated with the offshore wind farm and offshore substation were deemed to be slight significance to moderate significance.

Additional mitigation measures for areas of archaeological potential are required including the requirement for archaeological monitoring and excavation under licence. This will reduce the significance of effects to negligible, which is not significant in EIA terms. The Applicant will make provision to allow for and fund whatever archaeological work may be required at the site and the post excavation requirements in accordance with legislative requirements.

No other projects were considered to result in cumulative impacts on cultural heritage.

The potential effects of the Project on cultural heritage are considered to be of local extent and therefore, there is no potential for significant transboundary effects. The potential effects of the Project on cultural heritage setting were also examined within the Zone of Theoretical Visibility (ZTV) for the offshore infrastructure. The ZTV extends into Northern Ireland and therefore the assessment considered the potential to impact on cultural heritage features in Co. Down. The assessment concluded that there is no potential for significant transboundary effects on the cultural heritage setting from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on cultural heritage following the implementation of the measures outlined above.

7.10 Infrastructure Marine Recreation and Other Users

An assessment was undertaken to examine the potential impact of the Project on infrastructure, marine recreation and other users (below the High Water Mark (HWM)) during the construction, operational and maintenance, and decommissioning phases.

Information on infrastructure, marine recreation and other users was collected through a detailed desktop review of existing studies and datasets. The Infrastructure, Marine Recreation and Other Users Study Area included the offshore wind farm area and offshore cable corridor as well as all receptors within an area which has the potential to be affected by the Project.

The desktop review concluded that diving, boarding water sports, kayaking and canoeing, recreational fishing, beach users and recreation boating may occur within the study area. No existing offshore wind farms, wave and tidal energy developments, active cables or pipelines or aggregate extraction sites were identified.

Recreational boating is highly seasonal, with a greater density of vessels found throughout summer, as well as highly diurnal with boating occurring usually during the daytime. Boating areas include general sailing areas, racing areas, sailing school and sailing clubs. Recreational sea angling locations could be found around the coast of County Louth, from Carlingford Lough, south through Dundalk Bay and onwards towards Dublin. Inshore boat fishing was popular on Carlingford Lough from April through to September. A shore angling mark at Dunany Point was located to the north of the offshore cable corridor at the point of landfall. Scuba diving potentially occurs at identified wreck sites, reefs and geological areas of interest. There was a windsurfing club located approximately 14 km north of the offshore wind farm area, within Carlingford Lough however, it was likely that windsurfing activity was largely confined to Carlingford Lough. A surfing location was identified within the Infrastructure, Marine Recreation and Other Users Study Area; Kite surfing, surfing and windsurfing all had the potential to occur within the nearshore and inshore sections of the offshore cable corridor. The landfall is located at Dunany Bay Beach, which members of the public are likely to use for recreational activities.

The potential impacts assessed include:

- Displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels) in the study area, resulting in a loss of recreational resource during the construction, operational and maintenance and decommissioning phases;
- Displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, and beach users) along the nearshore and intertidal section of the

offshore cable corridor resulting in a loss of recreational resource during the construction and decommissioning phases; and

- Potential for sediment plumes to overlap with recreational diving sites, during the construction and decommissioning phases.

The following measures are included in the Project to reduce the potential for adverse effects:

- Implementation of marine safety zones around individual structures undergoing installation, major maintenance or decommissioning and around cable installation vessels and cable repair vessels;
- Notices to Mariners will be promulgated regularly during the construction phase, advising of the location, nature and timing of activities, ensuring that recreational activities can be planned accordingly;
- Information and notices will be posted at the landfall location advising of the nature, timing and location of cable installation activities, ensuring that recreational activities can be planned accordingly;
- Provision of suitable navigational aids, marine charting and lighting and marking;
- Implementation of Lighting and Marking Plan; and
- Use of guard vessels during installation and major maintenance activities.

Overall, it was concluded that there will be no significant effects arising from the Project with effects ranging from imperceptible to slight. This was due to the limited extent of the effects on the receptors and the localised, short term and reversable nature of the majority of effects and the implementation of measures to ensure disruption to receptors is minimised.

As all effects assessed were found to have no more than a slight adverse significance of effect, no further mitigation measures are deemed to be required.

Cumulative impacts were considered in relation to displacement of recreational sailing and motor cruising, recreational fishing (boat angling) and other recreational activities (diving vessels), and displacement of recreational fishing (shore angling) and other recreational activities (kayaking, kite surfing, surfing and windsurfing, and beach users) along the offshore cable corridor resulting in a loss of recreational resource during the construction phase. Projects considered included two site investigation proposals. Overall, it was concluded that there will be no significant cumulative effects from the Project alongside other projects.

Due to the potential impacts on infrastructure, marine recreation and other users receptors being limited to the immediate vicinity of the Project, there is no potential for transboundary impacts from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on infrastructure, marine recreation and other users following the implementation of the measures outlined above.

8 ASSESSMENTS – ONSHORE RECEPTORS

The EIAR has assessed the potential for impacts to arise during the construction, operational and maintenance and decommissioning phases of the Project. This section provides a non-technical summary of the assessments on onshore receptors undertaken for the Project. Further information on the assessments can be volume 2C of the EIAR.

8.1 Climate

The assessment on climate examines how the Project can impact on climate as a receptor and also the vulnerability of the Project to climatic factors.

The Climate Study Area includes the national environment (Ireland), where the receptor is the climate and the global atmosphere. Information on climate within the Climate Study Area was collected through a detailed desktop review of existing studies and datasets.

The weather in Ireland is influenced by the Atlantic Ocean, resulting in mild, moist weather dominated by maritime air masses. The prevailing wind direction is from a quadrant centred on west-southwest. These are relatively warm winds from the Atlantic and frequently bring rain. Easterly winds are weaker and less frequent and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer. Due to the proximity of the Project to the east coast, the Climate Study Area is more likely to experience a higher frequency of easterly winds than more inland locations or those on the west coast. The nearest Met Éireann meteorological station to the Project is the station in Dublin Airport.

The potential impacts assessed include:

- direct greenhouse gas (GHG) emissions associated with all phases of the Project. This includes embodied carbon in the material required to construct the project, transport emissions, waste quantities and use of Sulphur Hexafluoride (SF_6). Sulphur Hexafluoride is used in substation switchgear to maintain the optimum operating conditions. SF_6 is also used in the operation of the offshore substation and the WTGs;
- indirect GHG emissions reduction as a result of the renewable electricity generating plant reducing the generation of fossil fuel emissions at gas, peat and coal powered plants across the State. These changes in GHG emissions are associated with the operational phase of the Project; and
- vulnerability of all phases of the Project to climate change.

The following measures are included in the Project to reduce the potential for adverse effects:

- Measures included in the Project regarding traffic are outlined in chapter 28: Traffic and Transport of this EIAR and will mitigate the effects these impacts may have in terms of climate.
- Implement standard operating procedures that ensure no significant SF6 leakage from all onshore and offshore switchgear;
- Implement EMP and CEMP including measures and commitments relating to energy use;
- Materials with a reduced environmental impact will be incorporated into the construction design through re-use of materials or incorporation of recycled materials in place of conventional building material; and
- Implement a range of best practices design and construction measures for the Project to ensure that all phases of the Project are suitably resilient to the effects of climate change.

Embodied emissions are the carbon footprint of a material, i.e. the total emissions released throughout the supply chain of the material. This includes the energy required for extraction, processing, operation and disposal of a material. For some materials, such as steel, the use of recycled materials has a lower embodied greenhouse gas emissions than the use of virgin material.

With a construction phase ‘moderate adverse’ impact at 347,882 tonnes of CO_{2eq} generated, a further 51,069 tonnes of CO_{2eq} generated during the operation and maintenance phase and 34,230 tonnes of CO_{2eq} generated at decommissioning, the combined adverse impact is 433,181 tonnes of CO_{2eq} which will result in a ‘moderate adverse’ impact for climate.

The Project has the potential to displace circa 489,300 tonnes of greenhouse gas emissions from the largely carbon-based traditional energy mix in the national grid per annum. Over the 40 year lifetime of the Project this equates to circa 19 million tonnes of greenhouse gas emissions from the national grid.

With the potential to reduce 489,300 tonnes of CO_{2eq} from the current electricity generating sector in year one, the Project will have a net benefit for climate after year one of operation for the remaining 39 years of the project lifetime which will result in a permanent major 'beneficial' impact for climate.

The vulnerability of the Project to climate change is considered to be 'minor adverse' for all phases of the Project.

Cumulative impacts were considered in relation all the above impacts on climate. Projects considered the other offshore renewable energy projects that hold a MAC consent and the existing Arklow Bank Phase 1 WTGs.

The construction phase direct generation of greenhouse gases through the use of materials, transport of materials/personnel and the use of construction plant pose a potential for a permanent 'moderate adverse' impact for climate during the construction phase. The extent of these construction phase impacts are largely related to the scale of the construction site coupled with the nature of the materials employed.

There is also potential for cumulative indirect reduction of greenhouse gas emissions through the operation of these projects whereby these renewable projects will offset the combustion of fossil fuels for the production of electricity. Overall, the indirect effect will be of major beneficial significance, which is significant in EIA terms and more than offsets the direct adverse impact reported for the construction stage.

No significant adverse transboundary effects with regard to climate from the Project on the interests of other EEA States or the UK were predicted.

Overall the assessment concluded that the Project will result in significant beneficial residual effects on climate following the implementation of the measures outlined above.

8.2 Population and Human Health

The assessment on population and human health examines the potential impacts of the Project on land use and economic / employment impacts along with potential impacts on human health. The assessment is informed by other assessments in the EIAR including commercial fisheries; infrastructure, marine recreation and other users; climate; air quality; risk of major accidents and natural disasters; noise (airborne) and vibration; seascape, landscape and visual amenity and traffic and transport.

Population aspects of relevance to this assessment include economic impacts including socio economic status of the population, marine and land use, recreational amenity and community facilities. The health of a population is influenced by factors such as personal choice, location, mobility and exposure. These factors that influence health are called determinants of health and span environmental, social, behavioural, economic and institutional aspects. The human health assessment considers how changes to relevant health determinants as a result of the Project can impact public health outcomes.

The Population and Human Health Study Areas exhibit overall a growing population, low unemployment rates and on socio-economic / deprivation indices the study areas are broadly in line with national data. Much of the study area is rural in nature, however there are a number of larger towns notably Newry, Navan, Dundalk and Drogheda. Community and amenity facilities are concentrated within these and other urban centres.

In general, the communities within the Human Health Study Area in the Republic of Ireland have better health status than the national average for physical health indicators. Mental health and lifestyle indicators show a more mixed picture, with statistics available at county level showing worse health status than national averages, and indicators that are only available at regional and national level showing both positive and negative health status. The communities within the Human Health Study Area in Northern Ireland have relatively good health though this is slightly worse than the national average for health indicators.

The construction phase of the Project will create 240 jobs and the operational and maintenance phase will create 30 jobs, some of which will require a particular level of specialist expertise and may result in an increase in the volume of professionals in the study areas.

The Project will not have significant impacts on population. Impacts on employment and changes to the socio-economic status of the population and increased affluence at the construction, operational and maintenance and decommissioning phases were assessed as slight beneficial significance. Changes to

marine and land use were assessed as slight adverse, slight beneficial and imperceptible at the construction, operational and maintenance and decommissioning phases. Changes to recreational, amenity and community facilities were assessed as slight adverse or imperceptible at the construction, operational and maintenance and decommissioning and not significant. None of these impacts are considered significant.

The Project will have a moderate beneficial and significant impact on public health as a result of changes to wider societal infrastructure and resources; and from education and training; and from employment and income.

Public health effects from changes to transport modes, access and connections (onshore) and changes to open space, leisure and play were assessed as minor adverse and not significant. The public health effects of changes to community identity, culture, resilience and influence were assessed as both minor adverse and minor beneficial (not significant). Public health effects from changes to open space, leisure and play were assessed as of minor adverse significance.

Human health effects from changes to noise and vibration were assessed as minor adverse significance. Human health effects from climate change and adaptation were assessed as minor beneficial significance.

The following measures are included in the Project to reduce the potential for adverse effects:

- Installation of the grid connection cable infrastructure primarily underground and primarily along the route of existing road infrastructure;
- Implementation of a CEMP to avoid, minimise or mitigate disruption to the environment and surrounding area during the construction phase; and
- Implementation of a Construction Traffic Management Plan (CTMP) to avoid, minimise or mitigate disruption to traffic in the surrounding area during the construction phase.

The following additional measures will be implemented to enhance the public health opportunity for education and training, and employment and income benefits of the Project:

- In order to enhance the public health benefits of increased education and training, training opportunities will be offered through a workforce management plan.
- In order to enhance the public health benefits of good quality employment, employment opportunities will be offered through a workforce management plan.
- The Community Benefit Fund will assist in the delivery of enhanced amenity and community facilities which will be of benefit to the local population and their health in the long term.

The following monitoring will be implemented:

- Monitoring of the proportion of local people with long-term unemployment, high job instability or low income who enter good quality stable employment with the Project in order to confirm the expected benefit and further tailor the targeting of local vulnerable groups; and
- Monitoring of the proportion of NEETs (people not in education employment or training) taking up, and completing, training opportunities with the Project in order to confirm the expected benefit and further tailor the targeting of local vulnerable groups.

Cumulative impacts were considered for human health impacts only. The cumulative impact assessment is informed by the cumulative assessments included in the assessments that inform the human health assessment. The overall cumulative significance of effect remains unchanged as a result of the Projects assessed.

There is no potential for significant adverse transboundary effects with regard to population and human health from the Project upon the interests of other EEA States or the UK.

Overall the assessment concluded that the Project will not result in any significant residual effects on population and human health processes following the implementation of the measures included in the Project.

8.3 Onshore Biodiversity

The assessment on onshore biodiversity considers the potential impacts arising from the Project on terrestrial habitats, flora and fauna. The assessment also assesses the potential impacts on intertidal birds (i.e. birds occurring between the HWM and the Low Water Mark (LWM)).

The baseline environment for onshore biodiversity was characterised through a detailed desktop review of existing studies and datasets and a series of site-specific surveys for identifying protected and non-native invasive animals and plants.

During site-specific habitat surveys, key habitats recorded included freshwater, grassland, cultivated and built land, coastland, and woodland and scrub. Invasive alien plants were also noted within the area, including the third scheduled invasive species Japanese knotweed *Reynoutria japonica*. The following species were identified as present within the Onshore Biodiversity Study Area: bat, badger, otter, wintering and breeding birds, fish, and aquatic invertebrates.

The potential impacts assessed include:

- Disturbance from noise, vibration, lighting, and human presence (all phases);
- Removal and/or fragmentation of important ecological features (i.e. breaking up of a habitat, ecosystem, or land-use type into smaller parcels with a consequent impairment of ecological function) (construction phase); and
- Surface water run-off carrying suspended silt or contaminants into local watercourses (construction and decommissioning phases).

The following measures are included in the Project to reduce the potential for adverse effects:

- A suitably qualified and experienced ecologist will be utilised in the implementation of the measures;
- Implementation of a CEMP;
- Reinstatement and reprofiling of habitats;
- Demarcation of ecologically sensitive areas;
- Pre-construction surveys;
- Disturbance measures including timing of works to avoid the breeding bird and intertidal bird season, timing of works to avoid the peak movements of fish; and lighting restrictions;
- Surface water pollution measures;
- Retention of trees identified as having low and moderate suitability for roosting bats; and
- Avoidance and management measures to avoid the risk of introducing and control the spread of invasive alien plant species.

Potential effects as a result of disturbance were assessed for designated sites for nature conservation; commuting, foraging and breeding onshore birds; and foraging and resting intertidal and migratory birds. The effect was assessed to be localised, short-term, reversible, and not significant. Potential effects as a result of the removal and/or fragmentation of important ecological features was assessed for Dunany Point pNHA; depositing/lowland rivers; and onshore birds. The effect was assessed to be temporary, localised, medium-term, reversible, and not significant. Potential effect as a result of surface water run-off carrying suspended silt or contaminants into local watercourses was assessed for depositing/lowland rivers crossed by or adjoining the Project. The effect was assessed to be temporary, localised, short-term, reversible, and not significant.

It is proposed that replacement treelines/ hedgerows will be maintained for eight years, with seasonal checks by a suitably qualified arboriculturalist / ecologist for the first two years and yearly checks for the subsequent six years. Enhancement measures including wildflower planting at the onshore substation site and installation of bat and bird boxes are proposed.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

The potential effects of the Project on onshore biodiversity are considered to be of a local extent and therefore, there is no potential for significant transboundary effects with regard to onshore biodiversity from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on onshore biodiversity following the implementation of the measures included in the Project.

8.4 Land and Agriculture

The land and agriculture assessment examined how the onshore infrastructure of the Project could impact on landtake, severance, lands and agricultural practices. Site surveys, desktop studies and discussions with the landowners were used to understand the land use and practices along the onshore cable route and at the onshore substation site.

The lands along the onshore cable and at the onshore substation site are principally a mix of tillage/crop production and grass-based livestock farming. However, it should be noted that the majority of the onshore cable and jointing bays will be installed in the public road.

The potential impacts assessed include:

- Landtake (permanent and temporary) (all phases);
- Severance affecting access (construction and decommissioning phases);
- Severance of services and drainage to agricultural field (construction and decommissioning phases);
- Damage to lands (construction and decommissioning phases); and
- Noise, air and traffic impacts on agriculture (construction and decommissioning phases).

A total of 35 land parcels will be affected to varying degrees by the Project over a 27 month period to accommodate the actual construction of the onshore infrastructure of the Project. However, work is expected to progress along the onshore cable route in sections, with a typical active works duration of six weeks at any particular section.

There will be a requirement to temporarily acquire 29.6 ha of lands for the construction of the onshore substation, passing bays, river crossings, the M1 and rail crossings and the transition jointing bay (TJB). During the operational and maintenance phase, there will be requirement for permanent landtake (4.96 ha) at the onshore substation, along the onshore cable and at the TJB.

The following measures are included in the Project to reduce the potential for adverse effects:

- Permanent and temporary landtake will be dealt with by way of negotiated and agreed compensation;
- Reinstatement of lands, hedgerows, fencing and access;
- Implementation of measures to control impacts from dust, noise and traffic;
- Existing access to property will, where practicable, and with agreement of the landowner, be maintained during construction; otherwise reasonable temporary access will be provided; and
- Any disruption to water supply will be reinstated immediately or an alternative source supplied until the source is reinstated, unless otherwise agreed with the landowner. All drainage likely to be affected or disturbed during the construction phase will be identified and reinstated.

The Project will not have a significant effect on land and agriculture. It will have a slight adverse impact from a local perspective due to the permanent loss of some agricultural land but this impact is considered not significant. During the construction and decommissioning phases, the Project will have a slight adverse impact in terms of temporary landtake, severance, reinstatement and from disturbance impacts on 35 affected land parcels, however such impacts are not significant in EIA terms.

The following additional mitigation measure will be implemented on the eight land parcels that will be affected by more extensive construction activities associated with the construction of the substation, temporary construction compounds and the TJB:

- All agricultural lands temporarily acquired for the construction of the substation, the HDD crossings passing bays, and the TJB will, before return to the landowner, be subsoiled to alleviate compaction and

minimise risk of impeded crop growth and will be re-instated to pre-construction conditions unless otherwise agreed with the landowner.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

The potential effects of the Project on land and agriculture are considered to be of local extent and therefore, the Project will not result in any transboundary effects with other UK or EEA states.

Overall the assessment concluded that the Project will not result in any significant residual effects on land and agriculture following the implementation of the measures outlined above.

8.5 Soils, Geology and Hydrogeology

The soils, geology and hydrogeology assessment examined how the onshore infrastructure of the Project could impact on the subsurface conditions.

The Soil, Geology and Hydrogeology Study Area includes an area within 1 km of the planning application boundary for the onshore infrastructure. The baseline environment was characterised using databases from Geological Survey of Ireland, Environmental Protection Agency and National Parks and Wildlife Services.

The baseline assessment found that the topography is gently undulating ranging from 0 to 45 m above ordnance datum. There are six soil and subsoil types that predominantly underlie the Soil, Geology and Hydrogeology Study Area and these include Irish Sea till, till derived from chiefly Lower Palaeozoic rocks, till derived from limestone, alluvium, beach sands and gravels and glaciofluvial sands and gravels. Based on GSI map viewer, there are three different Lower Palaeozoic bedrock units; the Glaspistol Formation, Little Harbour Formation, Salterstown Formation and Clontail Formation. All the bedrock units are classified as Poor bedrock aquifers and there are 22 GSI listed boreholes within the Soil, Geology and Hydrogeology Study Area. The nearest recorded site, Dunany Point (LH017) County Geological Site (CGS), intersects the Project at the landfall location.

The Soil, Geology and Hydrogeology Study Area is underlain by the Louth Groundwater Body which has a Water Framework Directive (WFD) (2013-2018) Good Status and is currently ‘Not at Risk’.

The potential impacts assessed during the construction phase include:

- Soil: Loss of soil reserves; damage to soil structure through compaction and replacement;
- Geology: Removal of subsoil and shallow bedrock (if required) at the landfall and potential to impact on Dunany Point CGS; potential contamination from importation of engineering fill, crushed stone, concrete, reinforcement and other construction materials; and
- Hydrogeology: Contamination of groundwater; impact to Groundwater Level or Flow Path from Temporary Dewatering; change to groundwater level or flow path from works (trench or HDD).

The following measures are included in the Project to reduce the potential for adverse effects:

- Management of excavated materials;
- Reinstatement of lands to pre-construction conditions;
- Dewatering all groundwater from trenches, joint bays, etc. will be managed in line with industry best practices;
- Temporary storage of Cement Bound Material will be carefully managed; and
- Implementation of protection measures and controls for the safe handling and storage of fuels.

The sensitivity of receptors was predominantly low (soils and groundwater) with the exception of the CGS’s which were high sensitivity.

The method for the installation of the onshore cable is designed to minimise the impact on the potential environment. The standard construction techniques will have limited impact on the geological and hydrogeological environment as the excavation is shallow and will therefore interact with a very limited section of the geological profile. Overall, the significance of effect will be imperceptible and slight, which is not significant in EIA terms.

The construction of the offshore export cable and TJB at the landfall including associated temporary works have the potential to impact on Dunany Point CGS. However, the design of the installation of the offshore cable and TJB (options 1 and 2) were adjusted to minimise the footprint of works in the CGS and also to avoid the need for coastal protection minimise works in the CGS. Therefore, the impact was reduced to imperceptible, which is not significant in EIA terms.

Other projects that would contribute to a cumulative impact alongside the Project were considered including proposed wastewater treatment works. However, none of the projects identified would result in significant cumulative effects on soils, geology and hydrogeology.

The potential effects of the Project on soils, geology and hydrogeology are considered to be of local extent and therefore there is no potential for significant transboundary effects upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on soil, geology and hydrogeology following the implementation of the measures outlined above.

8.6 Hydrology and Flood Risk

This assessment examined the flood risk and the potential impact of the onshore infrastructure of the Project on hydrology. This assessment specifically examines the potential for impacts to the freshwater environment (i.e. the rivers and streams). Potential impacts on the marine environment are addressed in the assessment on marine processes, and potential impacts on groundwater are addressed in the soil, geology and hydrogeology assessment.

A site walkover and a desktop review of available online sources on water quality data were used to inform the assessment. A site-specific Flood Risk Assessment was completed for the onshore substation. The level of flood risk for the onshore substation site and the landfall location are low and medium along the onshore cable route.

The Hydrology and Flood Risk Study Area extends to 250 m beyond the application site boundary for the onshore infrastructure above the HWM. The Hydrology and Flood Risk Study Area also considers the wider WFD catchments and the nearest coastal waterbody. In this case, this includes the Slieveboy_010 sub-basin, which includes the landfall and eastern section of the onshore cable route, the Dee_080 and Dee_090 sub-basins, which includes the onshore substation site and the western section of the onshore cable route, and the Louth Coast (HA 06) coastal waterbody (CWB) to the east of the landfall location. These sub-basins are located within the Burren_SC_010 sub-catchment and the Dee_SC_040 sub-catchment.

The potential impacts assessed during the construction phase include:

- Potential obstruction and contamination of floodwaters from excavation works during flood events;
- Water quality impact to surface waters due to increased sediment discharge;
- Water quality impact to surface waters due to accidental spillages/discharge of chemicals/fuel;
- Potential obstruction to river flow at watercourse crossings using open trench method; and
- Interference with sediment transport at watercourse crossings using open trench method.

The following measures are included in the Project to reduce the potential for impact:

- Implementation of surface water management measures and accidental spillage controls prior to commencing construction and decommissioning works on site, in accordance with Best Practice Guidance;
- Onshore substation to be located outside the 1% AEP and 0.1% AEP predicted flood extents;
- Design for drainage infrastructure within the onshore substation site will limits peak run-off discharge to adjacent surface waters to the greenfield run off rate;
- Use off HDD crossing at four key watercourse crossings (River Dee (twice), Port and Arballan Stream (at Togher) and Salterstown stream);

- Cable installation above the culvert within the N33 carriageway (thereby avoiding interaction with the watercourse); and
- The stream beds at open trench crossings to be reinstated with original or similar material under the supervision of an aquatic ecologist.

Temporary increases in suspended sediment concentrations and associated deposition, and also accidental discharge of chemicals / fuels to surface waters during construction and decommissioning phases as result of excavation works were assessed to be imperceptible adverse significance be of imperceptible adverse significance as the effects are of local spatial extent, short term duration, intermittent and high reversibility.

The potential obstruction to flooding from excavation works and contamination of floodwaters during the construction and decommissioning phases of the Project was assessed to be of imperceptible adverse significance as the effects are deemed to be of local spatial extent short term duration and intermittent with high reversibility.

The proposed works (open trench method) within the smaller watercourse crossings (with lower flows) was assessed to be to be imperceptible adverse significance as the effects are deemed to be of local spatial extent, temporary duration, intermittent and low reversibility.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

The potential effects of the Project on hydrology and flood risk are considered to be of local extent. Therefore, there is no potential for significant transboundary effects on hydrology and flood risk from the Project upon the interests of the UK or other European Economic Area (EEA) States.

Overall the assessment concluded that the Project will not result in any significant residual effects on hydrology and flood risk following the implementation of the measures included in the Project.

8.7 Air Quality

The air quality assessment considers the sources of emissions to the atmosphere that are likely to be associated with the Project (including fugitive dusts, transport emissions) and how receptors may be potentially affected by these emissions.

A detailed desktop review of existing studies, datasets and information was undertaken to inform the assessment. National and local data has been assessed where relevant and available.

An Air Quality Study Area of 500 m from all the Project has been selected for the purposes of this assessment. County Louth was considered as the regional study area.

The surrounding landscape is typically agricultural and undeveloped with the surrounding fields employed for a mixture of tillage, pasture and arable uses. The road network along the onshore cable route is predominantly composed of national and local roads. The M1 and the Dublin to Belfast train line traverses the Project onshore cable route at Charleville Bridge.

The main existing sources of pollution in the Air Quality Study Area are from road/rail traffic, agriculture, and general dusts. The local and regional roads serve vehicles entering and leaving the M1 for operations in the area including other developments/construction, agriculture/farming, businesses (industrial and commercial) and residential in the vicinity. Local agricultural activities have the potential to give rise to combustion emissions from mobile plant (both on road and off road), dusts from ploughing, harvesting, etc. as well as odours from manure management. Typically, these sources are minor at local level and are predominately seasonal with increased activity in the spring to autumn months.

There are various sensitive receptors, including residential, agricultural and commercial located in the Air Quality Study Area and these receptors vary in distance from the onshore components of the Project. No primary or secondary schools were identified within the local Air Quality Study Area. However, a special education school and residential centre, St. Marys Special School, was identified within 500 m of the Air Quality Study Area, in Drumcar.

The EPA monitoring carried out in Zone D (Rural Ireland) shows that rural parts of Ireland generally experience good air quality with no breaches of the ambient air quality limits or the WHO Guidelines.

A number of potential impacts on air quality, associated with the construction and decommissioning phases of the Project were identified. These include:

- Fugitive dust generation from construction activities associated with the onshore infrastructure; and
- Increased vehicle emissions from traffic generation associated with the Project.

The following measures are included in the Project to reduce the potential for impacts on air quality:

- CTMP; and
- CEMP.

Potential impacts on sensitive receptors from fugitive dust generation during construction activities are predicted to be imperceptible significance, which is not significant in EIA terms during the construction phase and decommissioning phases.

During the construction phase only, there is potential for negligible effects from increased vehicle emission. The results indicate that all levels of pollutants are predicted to remain within the limits for the protection of human health and the WHO guidelines along each in a typical scenario year both with and without the proposed construction traffic. Offshore construction marine traffic is limited and as this activity is offshore and therefore will not be in the proximity to any residential property. Therefore, the potential for air quality impact from marine traffic emissions during construction is not considered in the assessment.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

The potential effects of the Project on air quality are considered to be of local extent therefore, there is no potential for significant transboundary effects on air quality from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on air quality following the implementation of the measures included in the Project.

8.8 Risk of Major Accidents and Natural Disasters

Major accidents and natural disasters refers to potential sources of both anthropogenic (human made) and biogenic (natural) hazards in the vicinity of the Project. The assessment examines the likely significant adverse effects potentially caused by accidents and/or disasters arising as a result of the Project on the environment, and the vulnerability of the Project to major accidents and/or natural disasters that would result in significant adverse effects (such as sea level rise, flooding).

The major accidents and natural disasters baseline was characterised using a detailed desktop review of existing studies and datasets and was informed by the other EIAR chapters. The assessment has followed the methodology set out in the following guidance: Major Accidents and Disasters in EIA: A Primer (Institute of Environmental Management and Assessment (IEMA), 2020). This approach directs the assessment to focus on low likelihood but potentially high consequence events such as a major spill, explosion, fire, etc. The approach set out in IEMA Primer includes three steps: screening, scoping and assessment.

The assessment of major accidents and hazards considers (i) risk events to which the Project itself may be vulnerable, i.e. the Project is the receptor; and (ii) risk events that may occur as a result of the Project and where the receptors may be human, environmental or material assets. These are as follows:

- Navigation and Shipping Collision: risk of physical impacts from other existing navigation and shipping vessels (collision / allision) impacting on all phases;
- Unexploded Ordinance (construction phase);
- Risk of accidents from existing built service infrastructure (cables and pipelines) (construction phase);
- Risk of physical impacts to other marine vessels (collision / allision) caused by Project vessels (all phases);
- Risk of pollution of the marine environment (all phases); and
- Traffic and transportation: collision risks on public roads (construction and decommissioning phases).

The assessment concluded that the measures included in the Project adequately control the potential for major accidents and/or disasters. As such, it is considered that there is no potential for major accidents and/or disasters to be caused by the Project and that the Project is not vulnerable to major accidents and/or disasters.

In terms of cumulative impact, the data presented for the Project has indicated that the risk of significant environmental impact from a major accident or disaster is very low given the measures proposed. The potential for cumulative impact would require the realisation of one of the hazards identified in addition to a similar hazard identified in another project. The probability for two such unlikely events, and the associated environmental impact, is negligible and hence there is no predicted cumulative adverse impact to the environment from major accidents and disasters.

8.9 Noise (Airborne) and Vibration

This assessment considered the potential noise and vibration impacts on onshore sensitive receptors from the onshore and offshore infrastructure of the Project during the construction, operation and maintenance, and decommissioning phases.

A combination of desktop studies and site-specific surveys were used to inform the assessment of the baseline noise environment in the Noise and Vibration Study Areas. Construction noise modelling was carried out in accordance with BS 5228-1:2009+A1:2014 and was implemented using Softnoise Predictor-LimA software or computational models as appropriate. Operational noise at the onshore substation was modelled using ISO 9613-2:1996 in Softnoise Predictor-LimA and offshore wind turbine noise predictions were undertaken using RPS MATLAB code implementing the modelling method described in Danish Executive Order BEK nr 135.

There is no national government guidance or legislation on the control of noise from offshore wind farms. Similarly, there is no guideline on the extent/size of the Noise (Airborne) and Vibration Study Area to adopt for the assessment of noise and vibration effects from electrical infrastructure or the construction or operation of wind farms on noise sensitive locations (NSLs). To inform this assessment, it was required to define three study areas which were set in accordance with best practice guidance and using professional judgement. During the construction and decommissioning phases, the Noise (Airborne) and Vibration Study Area considered NSLs up to 300 m from the onshore elements of the Project. The Study Area for the onshore substation set to 1 km from the substation property boundary. For operational Wind Turbine Noise, a Study Area of onshore locations within 20 km of the WTGs planned as part of the Project was considered.

Long-term unattended baseline noise surveys were conducted at ten sites along the coast and up to 4 km inland. Short-term attended noise surveys were conducted at four sites along the onshore cable route to inform the construction noise assessment and to characterise the existing baseline noise environment. A site representative of baseline noise conditions at the nearest NSL to the proposed onshore substation was chosen for attended night-time baseline noise monitoring. Weather monitoring was also conducted at select long-term noise monitoring locations and prevailing noise levels are primarily attributable, depending on location, to marine surf noise, wildlife, wind noise in foliage, local road traffic noise and other agricultural and anthropogenic noise sources in the localities.

The potential impacts assessed include:

- Noise impacts to onshore NSLs from offshore piling;
- Noise impacts to NSLs from construction at cable landfall;
- Noise impacts to NSLs from construction of onshore cable;
- Vibration impacts to NSLs from onshore cable construction;
- Noise impacts to NSLs from construction of onshore substation;
- Noise impacts to NSLs from operation of onshore substation;
- Noise impacts to NSLs from operation of offshore WTGs;
- Noise impacts to NSLs from operation of maintenance CTVs;
- Noise impacts to NSLs from decommissioning of cable landfall; and
- Noise impacts to NSLs from decommissioning of onshore substation.

Mitigation measures are proposed to reduce the impact of noise and vibration on NSLs as follows:

- Noise impacts to NSLs from construction at cable landfall: Approvals for any night work, implementation of a CEMP, implementation of BS 5228 noise controls, rock breaker temporary enclosure if required;

- Noise impacts to NSLs from construction of onshore cable: , implementation of a CEMP, implementation of BS 5228 noise controls, rock breaker temporary enclosure at specified joint bays, temporary barriers at specified HDD sites;
- Vibration impacts to NSLs from onshore cable construction: Formal stakeholder engagement, inform residents in advance of any rock breaking activity taking place within 20 m of a dwelling;
- Noise impacts to NSLs from operation of onshore substation: Low noise equipment, noise optimised design; and
- Noise impacts to NSLs from decommissioning of cable landfall: implementation of a CEMP, implementation of BS 5228 noise controls.

For most of the potential impacts, effects will be not significant in EIA terms. Where significant effects have been identified from construction of the onshore cable and noise impacts from the operation of the onshore substation mitigation measures have been specified to ensure that residual effects will not be significant.

Cumulative impacts were considered in relation to noise impacts to NSLs from construction at the landfall. Projects considered included an offshore site investigation survey proposal. Overall, the effects of cumulative noise activity from other projects concurrent with the Project will be not significant in EIA terms.

The border between Ireland and Northern Ireland (UK) traverses the Noise (Airborne) and Vibration Study Area. Noise monitoring locations were selected in Cranfield and Kilkeel, Co. Down, Northern Ireland to assess the impact from the operation of the WTGs on these locations. Imperceptible to 'not significant' adverse significance was concluded. Overall, no significant transboundary effects have been identified in the noise and vibration assessment and therefore, there is minimal potential for significant airborne noise or vibration transboundary effects from the Project upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on noise (airborne) and vibration following the implementation of the measures outlined above.

8.10 Seascape, Landscape and Visual Amenity

The Seascape, Landscape and Visual Impact Assessment (SLVIA) considers the changes that would occur to the existing seascape, landscape and visual amenity as a result of the introduction of the Project.

The baseline environment for seascape, landscape and visual characteristics with the SLVIA Study Area was collected through a combination of detailed desktop review of existing studies and datasets alongside a range of site-specific surveys and preparation of visibility maps that illustrate the potential for visibility of the Project. Visualisations illustrating the Project, including photographs and photomontages, have been provided to support the assessment.

A number of potential impacts on landscape and seascape, associated with the construction, operation and maintenance, and decommissioning of the Project were identified. These include:

- Seascape effects;
- Landscape effects;
- Designated landscape effects;
- Effects on Historic gardens and designed landscapes; and
- Visual effects.

The following measures are included in the Project to reduce the potential for adverse effects:

- Turbine locations are spaced to reduce visual clutter and avoid overlap with background landscape;
- Turbine towers and blades will be to a uniform colouration;
- Turbines will be of identical tower heights and rotor diameter;
- The onshore cable route is primarily within the existing roadways / roadside verges and thereby minimises the severance of farmed landscape and landscape features including hedgerows, trees and woodland;

- The chosen location for the onshore substation is as close as is possible to the existing Woodland – Louth 220 kV overhead line within a landscape at relatively low elevation and featuring wooded cover; and
- The use of colour and façade style on the onshore substation buildings is selected to reduce the impact of the onshore substation building on landscape and on visual receptors.

All the identified Landscape Character Areas and Seascape Character Areas within the SLVIA Study Area have been assessed for construction, operational and maintenance and decommissioning phase effects as a consequence of the Project.

The seascape and landscape assessment concluded that significant effects have been predicted to occur within coastal areas of the Large Bay Seascape, Large Open or Partially Open Sea Lough with Raised Hinterland Seascape, and localised areas of the Low Lying Coastal plain & estuarine landscape, low lying islands and peninsulas Seascape. Localised significant effects have been predicted for the Dunany, Boyne Estuary Landscape Character Area (LCA), Dundalk Bay Coast LCA and the Cooley Lowlands and Coastal Areas LCA. Localised significant effects have also been predicted to occur in localised coastal areas of the Clogherhead and Port Oriel Area of Outstanding Natural Beauty, though predicted effects soon become negated by intervening vegetation and topographical changes further inland. All other Seascapes and Landscape Character Areas are predicted not to experience significant effects, with effects ranging from moderate down to negligible to minor. No significant effects were predicted on any other protected landscapes assessed as part of the SLVIA.

The level of visual impact experienced by a viewer depends on their sensitivity and viewing opportunity, and the weather conditions at the time. The SLVIA has found that significant visual impacts are likely to occur at open coastal locations at closer proximity to the Project.

A total of 18 viewpoints have been assessed for construction, operational and maintenance, and decommissioning phases of the offshore elements of the Project, whilst 4 viewpoints have been assessed for the construction, operational and maintenance, and decommissioning phases of the onshore substation.

With regards to the operational impacts associated with the offshore elements of the Project; negligible to minor impacts are predicted to occur at 4 of the 22 viewpoints assessed; minor impacts are predicted to occur at two of the 22 viewpoints assesses; minor to moderate impacts are predicted to occur at four of the 22 viewpoints assessed; a moderate impact is predicted to occur at one of the 22 viewpoints assessed; moderate to major, assessed as not significant impacts are predicted to occur at six of the 22 viewpoints; major to substantial assessed as significant effects predicted to occur at 3 of the 22 viewpoints assessed (Cranfield Picnic Area and Caravan Park; Cooley Point and Lurganboy Beach). Two of these viewpoints represent the closest proximity to the Project and from which there are clear uninterrupted views of the offshore elements.

No significant visual effects, arising from the Project, have been predicted to occur for; settlements; long distance walkers/cyclists or for travelling receptors on road and rail.

With regards to cumulative effects with other projects such as utility upgrade works, mixed residential and commercial developments, offshore dredging, offshore site investigation works, onshore wind turbines and other proposed offshore wind farms it is considered that these developments, would be locally visible in combination with the Project, though no significant cumulative seascape, landscape or visual effects are predicted to occur.

The SLVIA has also considered and assessed the potential for transboundary effects with regards to seascape, landscape and visual aspects of the Project. Although there is the potential for transboundary effects to arise as a result of the Project, at distances over 8 km, from southern coastal and mountainous regions within Northern Ireland, no significant effects are predicted for such areas. Similarly, there is also the potential for transboundary effects to arise as a result of theoretical visibility of the Project, at distances over 90 km, from south western coastlines of the Isle of Man and western coastal portions of Anglesey. However, no significant effects are predicted due to the long distances involved, limited frequency of excellent visibility conditions and negligible magnitude of change predicted on seascape, landscape and visual receptors from coastal areas of the Isle of Man and Anglesey.

Overall the assessment concluded that the Project will result in some significant effects on seascapes, landscape and viewpoints used as part of the visual assessment.

8.11 Traffic and Transport

The assessment on traffic and transport considers the likely effects of the Project on the existing road network from the traffic generated by the Project during the construction, operational and maintenance, and decommissioning phases.

From a traffic and transport perspective, the key components of the Project that have the potential to impact on traffic and transport are the construction of the onshore cable from the landfall location to the onshore substation site along the existing road network and the construction of the onshore substation. The traffic and transport assessment also considers the potential impacts of the Project on traffic to ports used during all phases of the Project.

Desk based and site-specific surveys (automatic traffic surveys) were used to inform the assessment. The Traffic and Transport Study Area includes the road network associated with the onshore cable and onshore substation of the Project. The roads that will be directly impacted by the onshore cable and substation works are the N33, L-2226 (Mullinscross/Drumcar Road), L-6238 Castlethomas/Drumcar Road), L-2239 Togher Road (Keenan's Cross to Drumcar Road), L-2240 Togher Road (Keenan's Cross to Coast Road), L-2221 Coast Road and L-6223 Dunany Road.

The impact assessment identified the following potential means of impact during the construction and decommissioning phases:

- Impact of additional vehicles on existing traffic volumes;
- Impact of the temporary works on a live road network;
- Impact on local schools if advisory diversion routes are used; and
- Impact of onshore substation access on adjacent national road network.

The following measures are included in the Project to reduce the potential for adverse effects:

- Implementation of Construction Traffic Management Plan for localised traffic management during the construction phase; and
- To ensure safe access onto N33 and the regional and local road network sightlines in accordance with TII Publication DN-GEO—03060 (TII, 2017) are provided for the substation access and temporary access to the site compounds.

Due to the limited requirements for operational and maintenance trips to the onshore substation and the limited requirements for operational visits along the onshore cable route, traffic associated with the operational phase was scoped out of this assessment (with the exception of the impact of Port Traffic). It is envisaged that 30 operational personnel will be generated by the operational and maintenance personnel travelling to the operations and maintenance base.

The significance of effects due to additional construction vehicles on existing traffic volumes on roads impacted by the onshore cable route and the onshore substation are slight at most during the construction and decommissioning phases. The significance of the effects of the temporary works on the live road network are also slight at most during the construction and decommissioning phases.

Although there are no schools directly impacted by the onshore cable route, they are located in the wider hinterland and with advisory temporary diversions in place there could be potential additional traffic flows outside the schools. The significance of the effects of the advisory temporary diversions on the two schools in Dunleer village and St Mary's Special School, Drumcar is considered slight. However, the significance of the effects of the advisory temporary diversions on St Finian's National School and the St Colmcille National School are considered moderate and as such will require mitigation. The mitigation measure proposed is to hold discussions with the schools to determine if there is any impact on bus routes/access at the time of construction/decommissioning. The sequencing of the works can also be altered to ensure that works take place during school holidays. Once the aforementioned measure is implemented, it is predicted that the magnitude of the predicted impacts based on the close proximity school in the context of the routes associated with the advisory temporary diversions will be low.

The significance of the effects of the onshore substation access is considered to be slight at most during the construction and decommissioning phases.

The significance of the effects of construction port traffic is considered to be slight at most during the construction phase and decommissioning phases.

The cumulative impacts assessed include works associated with a proposed industrial/ business park and residential development which could coincide with the construction phase of the Project, as traffic from both use the N33 or the R132. However, the assessment outlined that the cumulative impact of the Project and the traffic associated with the industrial/ business park, and the residential development will be of slight significance.

The potential effects of the Project on traffic and transport during the construction phase are confined to the local road network and therefore, there is no potential for significant transboundary effects from the Project on traffic and transport upon the interests of the UK or other EEA States. Port traffic associated with all phases of the Project is not significant and therefore there will be no transboundary effects from the Project on traffic and transport upon the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on traffic and transport following the implementation of the measures included in the Project.

8.12 Material Assets

The assessment of material assets considers the potential disruption to built services and infrastructure (i.e. electricity, telecommunications, gas, water supply and sewerage infrastructure). The EPA Guidelines lists material assets as including '*Built Services, Roads and Traffic, and Waste Management'*. Roads and Traffic are addressed in chapter 27 and waste management is addressed in chapter 29. Services and infrastructure in the marine environment is addressed in chapter 16.

The material assets assessment considered the potential impact of the Project on onshore material assets during the construction, operational and maintenance and decommissioning phases. Material assets were characterised via a desktop study in which existing material assets were considered and assessed using existing datasets and information provided by built service providers.

The study area for the assessment of material assets has been defined as the area within the proposed planning application boundary for the onshore infrastructure of the Project and an area extending 300 m from this boundary.

Electricity, gas, telecommunications, potable watermains, sewerage and rail services were identified within or adjacent to the study area. These are located at various points within the study area, with some located along and intersecting the onshore cable route. Among the material assets identified, the onshore cable route crosses three high voltage overhead electricity lines, two high pressure gas pipelines, one rail line and several telecommunication lines and water pipelines.

During the construction phase of the Project, there is potential for disruption to built services along or in the vicinity of the Project during excavation and construction works to install the onshore cable route and the infrastructure at the onshore substation site. It is not anticipated that there will be a need for any temporary or permanent diversions of services to install the onshore infrastructure.

The following measures are included in the Project to reduce the potential for adverse effects:

- Any disruption to built services will be reinstated as soon as is practicable;
- Where required, ducting will be provided to allow for the provision of services (electrical/water);
- Prior to commencement of construction works the Contractor will be required to engage with all built services providers. The Contractor will continue liaison with providers as required throughout the construction phase.
- Prior to any mechanical excavation taking place, there will be consultation with ESB Networks to establish and verify the exact locations of all underground electricity cables. Gas Networks Ireland will also be consulted, and the exact position of the two gas transmission gas pipelines will be verified prior to works commencing.

- All work being conducted in the vicinity of underground services will be completed in accordance with the current Health and Safety Authority (HAS) 'Code of Practice for Avoiding Danger from Underground Services'. Furthermore, the ESB Code of Practice and HSA guidance, including the 'Code of Practice for Avoiding Danger from Overhead Electricity Lines', regarding exclusion and safe operating distances around electricity infrastructure will be adhered to. Height restriction barriers and equipment will be used to demark electrical infrastructure.

Any disruption to built services during the construction phase of the Project is predicted to be of slight adverse significance, which is not significant in EIA terms. This is because disruption is on a local scale, short-term duration and high reversibility.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

The border between Ireland and Northern Ireland is approximately 20 km from the study area. Although onshore cable will traverse under the Dublin to Belfast rail service, there is no potential for significant transboundary effects from the Project on utilities which would impact on the interests of the UK or other EEA States.

Overall the assessment concluded that the Project will not result in any significant residual effects on material assets processes following the implementation of the measures included in the Project.

8.13 Resource and Waste Management

The resource and waste management assessment considered the expected waste arisings during the construction, operational and maintenance and decommissioning phases of the Project and assessed if there is potential for impacts on waste receptors in the context of the availability and capacity of waste facilities to accept the waste.

A desktop study was carried out to estimate the amount of waste likely to be generated by the Project during the construction, operational and maintenance and decommissioning phases, identify suitable waste processing facilities in the region which could be considered to accept material that cannot be reused on site, and identify the locations of any historic waste facilities, pits and quarries within the Local Resource and Waste Management Study Area that may have the potential to contain waste material. The Local Resource and Waste Management Study Area includes the lands within the planning application boundary for the onshore infrastructure and a buffer area of 300 m to allow identification of potential areas where waste may have been disposed of in the past.

The predominant source of waste that will be generated during the construction phase of the onshore infrastructure of the Project arises from soil and stone excavation during the construction phase (40,000 m^3 from the onshore cable construction and 20,650 m^3 from the onshore substation site). The amount of waste generated by the Project is relatively small and the surrounding area has waste licenced facilities that have been shown to have sufficient capacity to deal with the calculated quantities. During the operational and maintenance phase, the main sources of waste will arise from the maintenance of the offshore infrastructure. Waste types include blackwater, grey water and waste lubricating and hydraulic oils.

Measures are included in the Project to ensure that any waste generated from the Project will be managed in accordance with the principles of the waste hierarchy (i.e. prevention, preparing for reuse, recycling, other recoveries, and disposal) and the Proximity Principle (i.e. waste will be managed close to its source). Other measures include:

- Implementation of the EMP and the CEMP;
- A Waste Manager will be nominated who will have overall responsibility for the implementation of all waste processes; and
- Sustainable practices will be implemented when choosing materials to be used in the construction of the Project, including the use of cement containing high levels of Ground Granulated Blast Furnace Slag or recycled steel.

Material will be reused on site to fill voids from the cable trench and other excavations where possible. Where this is not possible, priority will be given to recycling this material, placing it at a licenced facility that uses soil material for ground works or to backfill voids. If any material cannot be reused or recycled, it will be treated as waste and cleaned and disposed of appropriately and in accordance with applicable law.

The impacts during the construction, operational and maintenance and decommissioning phases for waste material that cannot be reused on site has been assessed to be of slight adverse significance, which is not significant in EIA terms.

Other projects that would contribute to a cumulative impact alongside the Project were considered. However, none of the projects identified would result in cumulative effects with the Project.

There is no potential for significant transboundary effects of waste from the Project on the interests of the UK or other EEA States.

Overall, the assessment concluded that the Project will not result in any significant residual effects on resource and waste management following the implementation of the measures included in the Project.

8.14 Bats in the Marine Environment

This assessment considered the potential impact of the Project on bats that may use the marine environment for activity (likely during March to October) and migration (likely in mid-March to May and mid-August to October) during the construction, operational and maintenance and decommissioning phases. The assessment is informed by a desktop study (on bat migration, risk from wind turbines and offshore activity) and offshore bat survey data, which was collected in the surrounding area to the Project.

The study area for this assessment has been defined as the Irish Sea, bounded by the potential migration corridors of the east/northeast of Ireland, south of Scotland, north of England and north of Wales.

No bats were recorded commuting or foraging adjacent to the Project during the offshore bat survey between May and August 2022. This survey was outside the migratory period (April and September to October) but coincided with the breeding season (late May to early August) when bats are most active.

For the nine resident bat species in Ireland, evidence of migration, risk from onshore turbines and offshore activity was used in determining which species are at risk of impact from the Project. Natterer's bat, lesser horseshoe bat and whiskered bat were identified as being not at risk of impact from the Project and common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat and Daubenton's bat were identified as being at risk of impact from the Project.

The potential impacts associated with the operational and maintenance phase of the Project include:

- Disturbance/ ultrasonic emission interference (i.e. interference with echolocation signal); and
- Injury and/or fatality (i.e. barotrauma (rapid atmospheric pressure fluctuations) and collision with rotors).

The effect of disturbance/ ultrasonic emission interference was assessed to be not significant for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat and Daubenton's bat. The effect of injury and/or fatality was assessed to be potentially significant for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and Leisler's bat. The effect of injury and/or fatality was assessed to be not significant for brown long-eared bat and Daubenton's bat.

As the assessment of impacts has concluded that there is potential for significant effects, measures will be required during bat migration. These include establishing turbine curtailment criteria based on a combination of conditions (i.e. ideal conditions for bats) to stop or slow down the turbines during peak bat migration periods. Static bat detectors will also be re-deployed evenly across the wind farm area. Following the implementation of the above measures, the residual effects of the Project will be not significant.

Cumulative impacts were considered in relation to disturbance/ ultrasonic emission interference; injury and/or death and collision with rotors and alteration of migration routes. Projects considered other proposed and existing wind farm projects in the Irish Sea. With the implementation of the aforementioned measures, the Project is considered not to have any cumulative significant residual effects on migrating bats.

As the study area for the assessment extends into the jurisdictions of UK and Northern Ireland, there is potential for the Project to result in transboundary effects. With the implementation of the measures outlined above, the Project will not result in any significant transboundary effects.

Overall, the assessment concluded that the Project will not result in any significant residual effects on bats in the marine environment following the implementation of the measures outlined above.

8.15 Interactions

The EIA Directive requires that the interaction between the factors for both offshore and onshore receptors are identified, described and assessed in the EIAR. The potential for interaction of effects has been assessed throughout the assessments presented in the EIAR in chapters 7-31. These chapters identify and assess the relevant impact either on, or from, the other factors.

An example of two key potential interaction of effects for offshore and onshore receptors arising from the Project are summarised below:

- Marine processes interactions include:
  - Benthic and Intertidal Ecology - impacts may lead to alteration of seabed habitats arising from effects of physical processes, including scour effects and changes in wave and tidal regimes resulting in indirect effects on benthic ecology during the operational and maintenance phase. Furthermore, installation of offshore infrastructure may lead to increases in suspended sediment concentrations and associated sediment deposition resulting in effects on benthic ecology.
  - Fish and Shellfish Ecology – there is the potential for increased suspended sediment concentration and associated sediment deposition resulting in indirect effects on fish and shellfish receptors (i.e., through avoidance behaviour, physiological effects, effects on eggs and larvae or smothering effects).
  - Marine archaeology – the installation of infrastructure within the offshore wind farm area and offshore cable corridor may result in the disturbance of sediment causing sediment deposition on the seabed resulting in potential effects on archaeological receptors.
  - Infrastructure, Marine Recreation and Other Users – the installation of infrastructure within the offshore wind farm area and offshore cable corridor may lead to increases in suspended sediment concentrations and associated sediment deposition which may affect the use of recreational dive sites.
- Population and human health include:
  - Traffic and Transport – the generation of traffic has the potential to indirectly affect population and human health through traffic movements and disruption to the local road network including hindering access to houses.
  - Air quality – the generation of emissions largely occur because of fugitive dust arising from onshore construction activities such as traffic movements and excavations. Such emissions have the potential to impact on human health. However, air quality impacts are scoped out of the human health assessments due to them having at most a slight adverse significance with standard measures included as part of the Project. This issue would therefore not be expected to affect human health.
  - Climate – The generating assets of the Project will be part of wider energy sector transition that reduces the severity of climate change. The benefits to human health will include reducing adverse physical and mental health effects of climate change for deprived populations, particularly in low- and middle-income countries globally. Also, during operation, the generating aspects of the Project will provide energy infrastructure that supports many aspects of public health. A reliable supply of electricity is required in relation to health-supportive factors including, population food safety, thermal comfort, healthcare, learning, income generation and social support.
  - Noise and vibration – noise and vibration has the potential to cause nuisance and disturbance to nearby residential receptors during all phases of the Project as a result of construction activities and operation of the substation.
  - Seascape, Landscape and Visual Amenity– landscape and visual impacts associated with all phases of the Project have the potential to impact on residential amenity and community facilities. In the construction phase such impacts will arise as a result of the presence of plant, personnel, and construction activities. During the operational and maintenance phase, effects arise from the offshore wind farm area and onshore substation.

Overall, the assessments conclude that there will be no significant adverse effects arising from the interaction of effects on each of the environmental factors as a result of the Project. A summary of the interactions are provided in chapter 32: Interactions of the EIAR.

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