Environmental Impact Assessment Report (EIAR)

Ballydermot Wind Farm Co. Offaly & Co. Kildare

Chapter 18 - Interaction of the Foregoing

Table of Contents

18. INTERACTION OF THE FOREGOING 18-1

18.1 Introduction 18-1
18.1.1 Statement of Authority 18-3
18.2 Impact Interactions 18-4
18.2.1 Population and Human Health 18-4
18.2.2 Biodiversity 18-13
18.2.3 Birds 18-19
18.2.4 Land, Soils and Geology 18-22
18.2.5 Water 18-27
18.2.6 Air Quality 18-28
18.2.7 Climate 18-29
18.2.8 Landscape and Visual 18-30
18.2.9 Vulnerability to Natural Disasters 18-31
18.3 Mitigation and Residual Effects 18-32

GLOSSARY OF TERMS

Term	Definition
Interaction of Effects	The combined, indirect, or secondary impacts that arise from the interaction between different environmental factors.

GLOSSARY OF ACRONYMS

Acronym	Definition
BMP	Biodiversity Management Plan
CEMP	Construction and Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CO2	Carbon Dioxide
DoEHLG	Department of the Environment, Heritage and Local Government
FRA	Flood Risk Assessment
GWBs	Groundwater Bodies
IAQM	Institute of Air Quality Management
KOR	Key Ornithological Receptors
LGV	Light Goods Vehicles
NIFM	National Indicative Flood Maps
Nox	Oxides of Nitrogen
OHL	Overhead Line
OPW	Office of Public Works
SO2	Sulphur Dioxide
TMP	Traffic Management Plan
ZTV	Zone of Theoretical Visibility

18. INTERACTION OF THE FOREGOING

18.1 Introduction

The preceding Chapters 5 to 17 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Health (including Shadow Flicker), Biodiversity (Flora and Fauna), Ornithology (Birds), Land, Soils and Geology, Water (Hydrology and Hydrogeology), Air Quality, Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage), Material Assets (Roads and Traffic, Telecommunications, Utilities and Waste Management), Aviation, and Vulnerability to/from Major Accidents and Natural Disasters as a result of the Proposed Project, as described in Chapter 4: Description of the Proposed Project of this EIAR. All of the potential significant effects of the Proposed Project and the measures proposed to mitigate these have been outlined in the preceding chapters of this EIAR. Mitigation measures and best practice measures for the construction, operation and decommissioning of the Proposed Project are detailed in the accompanying Construction and Environmental Management Plan (CEMP) (Appendix 4-4), and Chapter 19: Schedule of Mitigation and Monitoring Measures. However, for any development with the potential for significant environmental effects there is also the potential for interaction between identified potential effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect.

This chapter addresses the requirement under Article 3 of Directive 2011/92/EU, as amended by Directive 2014/52/EU, to assess the interaction between the environmental factors considered throughout the EIAR. The assessment presented in this chapter relies upon the assessment methodology established in Chapter 1: Introduction and the discipline-specific assessments contained within Chapters 5 to 17. The interaction assessment does not reassess the receiving environment or the individual environmental effects identified within those chapters; rather, it considers whether interactions between those assessed effects give rise to any additional or materially different environmental effects.

A matrix is presented in Table 18-1 below to identify potential interactions between the various aspects of the environment already assessed in this EIAR. The matrix highlights the occurrence of potential positive or negative effects during both the construction (C) and operational (O) phases. Section 18.2 below discusses only those interactions for which a credible interaction pathway has been identified between the environmental factors assessed in Chapters 5 to 17. Where no interaction pathway has been identified, no further assessment is provided. If two chapters do not have an interacting effect as outlined in Table 18-1, they will not be listed or discussed in Section 18.2.

It is considered that the potential effects during the decommissioning phase will be similar to the construction phase but of a lesser magnitude. In Section 18.2 below, the potential interactions between each environmental topic have been discussed in order of the relevant chapters of the EIAR. Once an interaction between two environmental topics has been assessed, for example, Population and Human Health and Water, the interaction will not be discussed again in the following relevant section, therefore there is no Water and Population and Human Health section.

Table 18-1 Interaction Matrix: Potential for Interacting Impacts

	Phase	Population and Human Health	Biodiversity	Birds	Land, Soils and Geology	Water	Air Quality	Climate	Noise and Vibration	Landscape and Visual	Cultural Heritage	Material Assets	Aviation	Major Accidents & Vulnerability to Natural Disasters
Population and Human Health	C													
	O													
Biodiversity	C													
	O													
Ornithology	C													
	O													
Land, Soils and Geology	C													
	O													
Water	C													
	O													
Air Quality	C													
	O													
Climate	C													
	O													
Noise and Vibration	C													
	O													
Landscape and Visual	C													
	O													
Cultural Heritage	C													
	O													
	C													

Material Assets	O													
Aviation	C													
	O													
Major Accidents and Vulnerability to Natural Disasters	C													
	O													

Legend: No Interacting Effect: Positive Effect:
Neutral Effect: Negative Effect:

The potential for interaction of effects has been assessed, throughout this EIAR, as part of the Impact Assessment process. Work on all parts of the Environmental Impact Assessment Report (EIAR) was carried out by a multidisciplinary team, the entire project and all the work of the sub-consultants was managed and coordinated by MKO. The EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and effects that potentially interact have been assessed in detail in the individual chapters of the EIAR and summarised in Section 18.2 below.

Where any potential negative effects have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR Chapters 5 through 17.

18.1.1 Statement of Authority

This section of the EIAR has been drafted by Catherine Johnson, with input from Joye Atkinson, and reviewed by Ellen Costello and Sean Creedon, all of MKO.

Catherine is a Project Environmental Scientist at MKO with 4 years of consultancy experience in climate, renewable energy, and sustainability. Prior to joining MKO in 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise in international climate law and policy, earth science, and sustainability/ESG processes. Catherine has a BSc in Earth and Ocean Science and an LLM in Global Environment and Climate Change Law.

Joye Atkinson is an Environmental Scientist with MKO with over 1 year of experience in both private practice and local authorities. Joye holds a BSc in Geography and Sociology from UCD. Joye has knowledge of planning systems having completed a one-year internship with RMLA Planning. Her key strengths and areas of expertise are in report writing, QGIS and ArcGIS pro and mapping.

Ellen is a Senior Environmental Scientist with over 6 years of consultancy experience with MKO and has been involved in a number of wind energy EIAR applications involving the compilation of numerous chapters including chapters on Material Assets. Ellen holds a BSc. in Earth Science and a MSc. in Climate Change: Integrated Environmental and Social Science Aspects.

This report has been reviewed by Sean Creedon (B.Sc., M.Sc.). Sean has 23 years' experience in planning and environmental impact elements within all stages of wind farm project delivery.

18.2 Impact Interactions

18.2.1 Population and Human Health

Population and Human Health and Land, Soils and Geology

Construction Phase

The construction of the Proposed Project will involve excavation works and the movement and management of peat and spoil, which may present a potential risk of soil and ground contamination and associated effects on population and human health. The Proposed Project has been designed to avoid the completed Peatland Climate Action Scheme (PCAS) at Lodge Bog. With the implementation of mitigation and monitoring measures detailed in Section 8.5.2 and Section 8.5.3 of Chapter 8: Land, Soils and Geology and the CEMP (Appendix 4-4), the potential for residual interaction associated with soil or ground contamination during the construction phase and subsequent effects on population and human health are short-term, imperceptible and negative.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Land, Soils and Geology relates to the permanent land-use change associated with the Proposed Project infrastructure and the potential soil or ground contamination. The Proposed Project permanent infrastructure footprint accounts for approximately 2.9% of the Project Site and has been designed to coexist with ongoing site activities including continued establishment and maturation of natural revegetation in suitable areas, site management, decommissioning works, and environmental monitoring under IPC Licence P0503-01. As such, the scale of land-use change and the potential for associated effects on population and human health are limited.

The Proposed Project includes Proposed Enhancement Areas, comprising peatland enhancement areas, native tree (woodland and scrub) planting areas and species-specific habitat enhancement and offsetting measures. These measures form part of the wider evolving land management context within which the Proposed Project will operate and will contribute to the ongoing transition from previously modified or degraded cutover bog to rehabilitated peatland habitats. Targeted rehabilitation activities within Proposed Wind Farm site, i.e., for the 14 no. bogs forming part of the Allen Bog Group under the IPC Licence, will be implemented during the operational phase of the Proposed Project.

The Proposed Project will introduce permanent infrastructure resulting in localised permanent changes in land use within the Project Site. Following completion of construction and reinstatement works, the Proposed Grid Connection underground electrical cabling route will not result in a permanent change in land use. As such, the small scale of the Proposed Project infrastructure footprint relative to the Population Study Area as discussed in Chapter 5: Population and Human Health Section 5.2.1.1, its ability to coexist with ongoing site activities and activities within the landscape will result in a long-term, imperceptible negative residual interaction between land use and population and human health.

The operation of the Proposed Project has the potential to result in soil or ground contamination through the accidental release of fuels, oils or other contaminants associated with maintenance activities. Contamination could indirectly affect population and human health through impacts on soil and groundwater quality. Following the implementation of the mitigation and monitoring measures as detailed in Section 8.5.2 and Section 8.5.3 of Chapter 8: Land, Soils and Geology and the CEMP (Appendix 4-4), the residual interaction associated with soil or ground contamination during the operational phase and subsequent health effects are long-term, imperceptible and negative.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

Population and Human Health and Water

Construction Phase

Potential health effects during construction arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies, see Section 5.7.3.2.4 of Chapter 5: Population and Human Health, Section 9.5.2.16 of Chapter 9: Water, Section 3.2 of Appendix 4-4 (CEMP) and Section 2.3 of Appendix 4-6 (SWMP).

There are no mapped PWS or GWS within the Project Site. The closest mapped GWS is the Bracknagh Rech GWS, located approximately 0.6km south of the Proposed Wind Farm in the townland of Rathangan and it is located within the Population Study Area; the mapped source protection zone for this GWS does not fall within the Project Site. The closest mapped Public Water Supply (PWS) is the Clonbullogue PWS, located approximately 0.5km west of the Proposed Wind Farm in the townland of Clonbullogue, Co. Offaly, located within the Population Study Area. Local streams and rivers also act as a hydrological barrier between the Project Site and these water supply schemes. Mitigation measures in Section 5.7.3.2.4 of Chapter 5 and Section 9.5.2.16 of Chapter 9 will ensure that surface runoff from the Project Site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies, nor impact on group water schemes and human health.

The closest abstraction for drinking water downstream of the Proposed Wind Farm is associated with the Barrow PWS and the Barrow_130 Drinking Water Protection Area (DWPA). The shortest hydrological flow path between the Project Site and this DWPA is approximately 35km in length. The Liffey_150 DWPA is also located downstream of the Proposed Grid Connection in the Liffey and Dublin Bay Catchment. This DWPA is located near Celbridge, Co. Kildare and is approximately 15km to the northeast of the Proposed Offsite Substation. Any potential effects on these downstream DWPAs and its impact on human health are limited given their distance from the Project Site. Under a precautionary scenario, the residual interaction is short-term, imperceptible and negative.

The potential for effects on surface water quality from excavation dewatering will likely occur in turbine base, and substation excavations, and these will create additional volumes of water to surface water (i.e. rainfall water) and groundwater seepages to be treated by the drainage management system. The main potential significant effects are as a result of turbidity and suspended solids on downstream surface water receptors.

Potential effects from earthworks resulting in suspended solids entrainment in surface waters construction phase activities will require varying degrees of earthworks resulting in excavation of peat and mineral subsoil where present. It is estimated that construction works will require the excavation of peat and spoil which will be a significant potential source of sediment laden water. Construction activities can result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality of downstream water bodies. If watercourses were impacted by earthworks there would be no potential effects on population and human health as these watercourses are not used for drinking-water abstraction or recreational purposes, and no hydrological connection to human water supplies has been identified.

Therefore, following implementation of the mitigation measures described in Chapter 9, the residual interaction between population and human health and water is short-term, imperceptible and negative.

Operational Phase

During the operational phase, the potential for silt-laden runoff will be reduced compared to the construction phase. In addition, all permanent drainage controls will be in place, and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of site entrances, internal site access roads, hardstand areas and amenity tracks. These works would be of a very minor scale and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works. These minor activities could, however, result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality. During such maintenance works there is a small risk associated with release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on site during the operational phase.

Placed concrete in turbine bases and foundations can also have minor local effects on groundwater quality over time. However, due to the limited surface area of exposed concrete, the anoxic conditions below ground, and the high rate of dilution from the wider groundwater system relative to the small volumes of groundwater that would come in contact with the concrete, the residual interaction between groundwater quality and population and human health is considered to be imperceptible, negative and long-term.

During the operational phase the wind farm control building, included in the Proposed Onsite Substation compound and Proposed Offsite Substation compound, will include staff welfare facilities. While the release of untreated wastewater has the potential to affect groundwater quality, wastewater will be managed though the implementation of the wastewater management measures identified in Section 9.5.2.6 of Chapter 9. Following implementation of these measures, the residual interaction between surface water quality and population and human health will be negative imperceptible, and temporary.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phases is Not Significant.

Population and Human Health and Air Quality

Construction Phase

The excavation and movement of peat and spoil during the construction phase of the Proposed Project is likely to create dust and result in the emission of air pollutants. Following implementation of the mitigation measures detailed in Section 10.3.2. of Chapter 10: Air Quality, the residual interaction between Population and Human Health and Air Quality during the construction phase is short-term, slight and negative.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Air Quality relates primarily to emissions associated with operational traffic and maintenance activities, together with the wider improvement in air quality arising from the displacement of emissions associated with fossil fuel-based electricity generation.

The Proposed Project will generate additional traffic to the area in the form of 1 to 2 light goods vehicles (LGVs) visiting the Project Site daily for maintenance and monitoring works, as well as up to 50 no. amenity-related car trips per day as stated in Section 10.3.3.1 of Chapter 10. There are 4 no. amenity car parks forming part of the Proposed Project to facilitate access for the local community and tourists to utilise the internal amenity tracks within the Proposed Wind Farm and the greater connectivity of the Proposed Wind Farm to the Cloncreen Wind Farm, Grand Canal and Killinthomas woods. The emissions associated with operational traffic and maintenance activities are negligible and therefore the residual interaction between air quality and human health in this instance is limited.

The operation of the Proposed Project will also generate renewable electricity, providing an alternative to electricity derived from coal, oil or gas-fired power stations during the operational phase. The Proposed Project will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2). Due to the production of renewable energy from the Proposed Project and associated reduction in emissions, the residual interaction between air quality and population and human health is considered long-term, slight, and positive during the operational phase.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Population and Human Health and Climate

Construction Phase

Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides, associated with the production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities.

The construction of the Proposed Project will have a short-term, negative and imperceptible effect on climate and will be restricted to the duration of the construction phase. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate, therefore the residual interaction between climate and population and human health will be permanent, imperceptible and negative.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Climate relates primarily to the reduction in greenhouse gas emissions resulting from the generation of renewable electricity and the consequent reduction in reliance on fossil fuel-based electricity generation.

The operational phase of the Proposed Project will generate additional traffic to the area in the form of light goods vehicles (LGVs) with the approximately 1-2 visits by site staff and 50 amenity users proposed to access the Proposed Wind Farm amenity track per day. On occasion, daily visits by HGVs may be required over short periods during maintenance/component replacement activities. The addition of LGV/HGVs on occasion over the 35-year lifetime of the Proposed Project will give rise to a long-term, imperceptible, negative effect on climate, and therefore population and human health.

The Proposed Project when in operation, will reduce the input of carbon intensive energy into the national grid and reduce the amount of greenhouse gas emissions being released to the atmosphere. Harnessing more energy

by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. The rated output of 7 MW per turbine for the Proposed Project would result in an estimated installed capacity of 322 MW, displacing approximately 146,857 tonnes of carbon dioxide per annum or 5,139,995 tonnes over its operational life from traditional carbon-based electricity generation.

The Proposed Project will offer significant benefits in terms of renewable energy production and reductions in greenhouse gas emissions. In this regard, the indirect residual interaction between climate and population and human health will be long-term, slight, and positive due to the offsetting of greenhouse gas emissions that will occur during the operational phase of the Proposed Project.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational and decommissioning phase is Not Significant.

Population and Human Health and Noise and Vibration

Construction Phase

As identified in Section 5.7.2.2.5 of Chapter 5: Population and Human Health of this EIAR, the construction phase will generate an increase in noise levels in the vicinity of the Project Site which has the potential to cause a nuisance to sensitive receptors in the area.

The distances between the construction activities associated with the Proposed Project and the nearest Noise Sensitive Locations (NSLs) are such that there will be no significant noise and vibration impacts at the NSLs. In all instances the predicted noise levels at the nearest NSLs are below the adopted significance threshold detailed in Section 12.6.2.1.1 of Chapter 12: Noise and Vibration.

The contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise* and all mitigation measures, as detail in Chapter 12 and the CEMP (Appendix 4-4), will be implemented. With the implementation of mitigation measures, the residual interaction between human health and noise and vibration arising from construction phase activities will be negative, imperceptible, and short-term.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Noise and Vibration relates primarily to operational noise associated with the Proposed Turbines and the Proposed Onsite Substation and Proposed Offsite Substations.

The predicted noise emissions during the operational phase from the Proposed Turbines, once the appropriate mitigation measures are implemented, will be long-term, imperceptible and negative. Furthermore, as noise emissions from turbines are controllable via inbuilt technologies, the Proposed Project will be able to comply with the *'Wind Energy Development Guidelines for Planning Authorities'* (Department of the Environment, Heritage and Local Government (DoEHLG), 2006) (hereafter referred to as the WEDG 2006) and future iterations should they come into effect before a decision is made on this application. Likewise, the Proposed Turbines will be capable of achieving compliance with noise conditions imposed should the Proposed Project

receive a grant of planning permission. The residual interaction between noise and vibration and population and human health resulting from the Proposed Turbines will be long-term, imperceptible and negative.

The Proposed Onsite Substation is located in the eastern section of the Proposed Wind Farm, northeast of Lodge Bog, Co. Kildare. The Proposed Offsite Substation is located within an agricultural field east of the Proposed Wind Farm. During the operational phase, noise emitted from both substations will be below the level for fixed mechanical plant outlined in Section 12.3.7 of Chapter 12 and will not result in an adverse impact at NSLs within the Fixed Plant Operational Study Area (defined in Section 12.4.1 of Chapter 12). Therefore, the residual interaction between noise and vibration arising from fixed plant during the operational phase and population and human health will be imperceptible, long-term and negative.

The operational phase impacts associated with the Proposed Grid Connection underground electrical cabling route are considered to be negligible, as this infrastructure will be located within the public road corridor and will not give rise to ongoing noise or vibration effects once construction is complete. Therefore, there is no potential for interaction between noise and vibration arising from the Proposed Grid Connection underground electrical cabling route and population and human health.

The overall residual interaction between the noise and vibration and population and human health is therefore long-term, imperceptible and negative, during the operational phase of the Proposed Project.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Population and Human Health and Landscape and Visual

Construction Phase

During the construction phase, the interaction between Population and Human Health and Landscape and Visual relates primarily to temporary changes in visual amenity arising from construction activities, including the erection of turbines, substations and associated infrastructure, and the resulting effects on residential amenity.

The erection of the Proposed Turbines will change the existing landscape. The visual effects arising from the construction of the Proposed Turbines and the ancillary infrastructure such as roads and hardstands to service and build turbines T01 to T46 will be experienced by a range of residential receptors in the landscape surrounding the Proposed Wind Farm. These effects will be localised to the Proposed Wind Farm itself due to the flat nature of the landscape and enclosure by boundary vegetation, therefore the residual interaction between visual effects and residential receptors outside of the Project Site will be short-term, negative and not significant for the construction phase.

Visual effects will occur as the Proposed Onsite Substation and Proposed Offsite Substation are built due to the earthworks and requisite construction activities. Intermittent visibility of both the Proposed Onsite Substation and Proposed Offsite Substation construction will occur from nearby residential receptors, particularly from the receptors located along the R414 in Lullymore East, immediately east of the Proposed Onsite Substation, as well as residential receptors to the east of the Proposed Offsite Substation along the L-6002 local road. However, many of these residential receptors, as well as the road themselves, are surrounded by treelines and hedgerows that will provide visual screening towards the proposed substations. The residual interaction between population and human health and visual effects arising from the construction of the Proposed Onsite Substation and Proposed Offsite Substation are considered to be negative, short-term and moderate on residential receptors.

The 13.1km of 220kV underground cabling connection which forms part of the Proposed Grid Connection will be temporary, localised, and transient in nature and will cause temporary change to the physical landscape along the Proposed Grid Connection underground electrical cabling route. The construction activities may potentially cause effects on the landscape from the creation of temporary structures, dust, minor soil erosion and minor alterations to drainage. The construction phase of the Proposed Grid Connection underground electrical cabling route will have a temporary slight negative residual interaction with population and human health.

The residual interaction between the landscape and visual and population and human health is therefore short–term, slight and negative, during the construction phase of the Proposed Project.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Landscape and Visual relates primarily to long-term changes in visual amenity arising from the operation of the Proposed Wind Farm and Proposed Grid Connection. Whether the long-term change in landscape created by the erection of the turbines is deemed to be positive or negative is a subjective matter. What appears to be a positive visual effect to one viewer could be deemed to be a negative effect by another viewer.

The landscape character of the Project Site will undergo major changes from the introduction of vertical man-made structures within the landscape of Project Site. There will be a substantial magnitude of change to the landscape in the localised areas within the Project Site where the landscape is materially altered (infrastructure footprint). Significant residual visual effects are identified at 4 no. representative viewpoints, reflecting the sensitivity of the visual receptors and the magnitude of change experienced at those locations and 8 no. viewpoints are rated of Moderate significance. The higher ratings of significance at the above listed viewpoints are due to the High sensitivity of the visual receptors, namely local residents living in close proximity to the Proposed Turbines and receptors at designated scenic routes, hilltop views and areas of high amenity, combined with a Moderate or Substantial magnitude of change.

The identification of a significant visual effect at an individual representative viewpoint does not, in itself, constitute a significant effect on Population and Human Health. As set out in Section 5.6, residential amenity is considered in the context of the overall experience of a resident and is informed by a combination of environmental factors, including visual amenity, noise, shadow flicker, traffic, dust, land-use and general disturbance. Visual effects identified in Section 13.8.3.2 therefore represent one of the tracks through which residential amenity may be affected.

Section 13.8.3 of Chapter 13: Landscape and Visual and Appendix 13-5 identifies that visibility from many residential receptors is restricted by the flat, low-lying nature of the receiving landscape and the prevalence of mature boundary vegetation, with visual effects further reduced through the embedded design measures incorporated into the Proposed Project. These visual effects have been taken into account in the assessment of residential amenity in Section 5.6, together with the other factors which influence residential amenity. Following implementation of the mitigation measures relating to landscape and visual the Proposed Project will have a long-term, slight, negative residual effect on residential amenity.

Accordingly, the residual interaction between Landscape and Visual and Population and Human Health during the operational phase is long-term, slight and negative.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Population and Human Health and Material Assets

Construction Phase

During the construction phase, the Proposed Project will give rise to traffic movements of abnormal loads and increased traffic volumes on the local road network, giving rise to potential impacts on residential amenity.

A Traffic Management Plan (TMP) will be implemented prior to construction to minimise all disruption, as described in Section 15.1 of Chapter 15: Material Assets, the TMP (Appendix 15-2), and the CEMP (Appendix 4-4). During the construction phase, impacts on the surrounding local highway network will be short-term, negative, and imperceptible. With the implementation of measures detailed in Chapter 5: Population and Human Health and the CEMP (Appendix 4-4) dust and exhaust emission will be contained as per the mitigation measures proposed in Chapter 10: Air Quality and Chapter 11: Climate and therefore, the potential for impacts on health will be short-term, negative and imperceptible.

There is no potential during the construction phase for the Proposed Project to interact with telecommunications.

Other material assets pertaining to existing OHL infrastructure, 1 no. watermain within the Other Material Assets Study Area (defined in Section 15.3.1.2 of Chapter 15: Material Assets, and 2 no. existing gas pipelines within the Other Material Assets Study Area. Prior to construction, the Applicant will engage with ESB, Uisce Éireann, and Gas Networks Ireland (GNI) in advance of finalising the detailed design in the vicinity of existing OHL infrastructure, the identified watermain and gas pipelines. All proposed guidance documents from ESB, Uisce Éireann, and GNI will be adhered to during all proposed works. Therefore, the residual interaction on built assets and population and human health will be short-term, negative and imperceptible during construction of the Proposed Project.

The residual interaction between material assets and population and human health is therefore considered to be short-term, negative and imperceptible.

Operational Phase

During the operational phase, the Proposed Turbines present as obstacles within the landscape to telecommunications and the Proposed Project infrastructure footprint may impact on other material assets (i.e., electricity infrastructure, gas pipelines, and water mains).

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The alternating current, electrical generating and transformer equipment associated with wind turbines, like all electrical equipment, also generates its own electromagnetic fields, and this can interfere with broadcast communications. Ai Bridges was commissioned to carry out a detailed telecommunications impact assessment (Appendix 15-7). A relay mast is proposed to mitigate for the impacts caused by the Proposed Turbines on Virgin Media radio links. A standard Protocol Document will be prepared by 2RN for the Proposed Project and will be signed by the Applicant prior to construction. The Proposed Project will have a long-term, neutral effect on the telecommunications signals due to the achieved setbacks from links, the 2rn Protocol Document and the proposed relay mast to mitigate impacts to the Virgin Media telecommunications links.

In relation to traffic, major component failures are considered unlikely with the implementation of normal operational and maintenance activities and therefore the presence of HGVs at the Proposed Project is considered extremely rare until the decommissioning phase commences. Should a turbine component need replacing, the measures detailed in Section 15.1.13 of Chapter 15 will be implemented. All site visits for maintenance and inspection purposes will be done so via LGVs. No permanent staff will be in place during the operational phase. Likewise, amenity visitors to the Proposed Wind Farm will use private vehicles / buses and

utilise one of the four amenity car parks located at access points spread around the Proposed Wind Farm to minimise volumes of traffic arriving at one location. It is considered that the residual interaction between road users and material assets will be negative, imperceptible, and long term.

As no groundworks are proposed as part of the operational phase of the Proposed Project, there is no interaction with the watermain, or gas pipelines located within the Proposed Wind Farm site.

As the Proposed Project has the potential to supply 322MW of renewable electricity generation to the national electricity network, improving the resilience and diversity of electricity supply while reducing dependence on fossil fuel-based generation. This also contributes to reductions in emissions, providing indirect benefits for population and human health.

Overall, the residual interaction between material assets and population and human health is considered to be long-term, slight, and positive during the operational phase due to the offsetting of greenhouse gas emissions that will occur during the operational phase of the Proposed Project.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Population Human Health and Aviation

Construction Phase

During the construction phase, the interaction between Population and Human Health and Aviation relates to the potential for temporary effects on aviation safety associated with crane operations and turbine erection. As assessed in Chapter 16: Aviation, there is no potential for impacts on radar, as well temporary crane operations and the erection of the Proposed Turbines will not penetrate restricted airspace. Following implementation of the aviation safety measures described in Chapter 16, the residual interaction with Population and Human Health, under a precautionary scenario, is short-term, slight and negative.

Operational Phase

During the operational phase, the interaction between Population and Human Health and Aviation relates to the safe operation of aircraft in the vicinity of the Proposed Project.

As per the construction phase, the Proposed Turbines will not penetrate restricted airspace (i.e., MOA 4 and EI-R16). However, the physicality of the Proposed Turbines would create an 'obstacle field' in the airspace below the Restricted Airspace which would require notification to the IAA as well as being subject to lighting regulation to ensure aircraft safety and visibility.

Subject to compliance with the obstacle registration, notification, marking and lighting requirements that will be agreed with the IAA, the Proposed Turbines are not considered to represent a material alteration to the aviation obstacle environment of the area, but rather an extension of an already-established wind energy obstacle field to which aviation activity in the vicinity is already required to have consideration of. Therefore, under a precautionary scenario, a long-term, slight, negative residual interaction between population and human health and aviation has been identified on restricted airspace during the operational phase.

The potential for operational phase impacts on aviation receptors is therefore limited to the presence of structures within controlled or monitored airspace, which will be managed through compliance with all relevant aviation safety requirements and procedures. The residual interactive is considered to be long-term, slight and negative between population and human health and aviation.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

18.2.2 Biodiversity

Biodiversity and Birds

Construction Phase

Site activities during the construction phase of the Proposed Project may have the potential to give rise to disturbance and deterioration of habitat to birds and their prey species. An overview of survey data is included in Section 7.3.7 of Chapter 7: Birds with detailed maps provided in Appendix 7-4 (Survey Data). Survey data and maps relating to roost sites are provided in Confidential Appendix 7-5.

Potential impacts on Key Ornithological Receptors (KORs) during the construction phase are included in Section 7.5.2 of Chapter 7. Potential significant impacts are identified for Whooper Swan, Lapwing (breeding) and Snipe due to habitat loss and disturbance effects during the construction phase. Construction phase habitat loss effects on Snipe are assessed as slight and Not Significant. Construction phase effects on Golden Plover, Hen Harrier and Lapwing (wintering) are also assessed as slight.

A range of mitigation measures are proposed to mitigate identified significant effects. The Proposed Enhancement Areas which contain and enhancement and offsetting measures proposed as part of the Proposed Project are detailed within the Biodiversity Management Plan (BMP), provided as Appendix 6-5 and Chapter 7, Section 7.6.4 to mitigate impacts on habitats and disturbance for Whooper Swan, Lapwing (breeding) and Snipe. With the implementation of mitigation measures the residual interaction between biodiversity and birds is considered to be short-term, negative and slight.

Operational Phase

As part of the BMP, to offset the loss of roosting habitat and disturbance effects for whooper swan and the loss of breeding habitat and disturbance effects for breeding lapwing, two shallow waterbodies (7.8ha and 5.6ha, approximately 1.5m deep) will be created for roosting whooper swan, and three predator-proof breeding wader areas (12ha, 7ha and 6ha, totalling 25ha), managed as open short-sward habitat with wader scrapes, will be created for breeding lapwing. Both measures are located at Lodge Bog. In addition, 62ha of open peatland/grassland habitat with wader scrapes will be created at Killina Bog, which will also benefit lapwing. The waterbodies and breeding wader areas will provide replacement and additional suitable habitat for whooper swan and lapwing. The residual interaction between the habitat measures proposed as part of the Proposed Enhancement Areas and birds during the operational phase is considered to be long-term slight, and positive.

The creation of approximately 276ha of scrub mosaic habitat within 250m of the Proposed Turbines will result in less suitable habitat for golden plover. However, measures proposed in Killina Bog and Lodge Bog (as outlined above in the construction phase) will increase habitat suitability for golden plover within these

locations, i.e., away from the Proposed Turbines. The Proposed Enhancement Areas will result in a positive, slight, long-term residual interaction of habitat suitability with birds.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational and decommissioning phase is Not Significant.

Biodiversity and Land, Soils and Geology

Construction Phase

The construction of the Proposed Project will involve excavation works and the movement and management of peat and spoil, which may present a potential risk of soil and ground contamination and associated effects on biodiversity.

The Proposed Project has also been designed to minimise the loss of uncut raised bog to preserve high-value habitat. However, the construction of the Proposed Project will result in the direct loss of approximately 31.75ha of cutover bog habitat which is developing as a mosaic of Calluna-dominated vegetation, poor fen communities, and reed and large sedge swamp habitats. The Proposed Project will result in the loss of approximately 131.7ha of Scrub (WS1) and scrub mosaic habitats, and 44.3ha of Bog woodland (WN7), totalling 176ha of these habitats. The loss of these habitats collectively will occur as a result of the construction of Proposed Turbine hardstands, proposed access roads, proposed peat and spoil areas and other associated Proposed Project infrastructure. There will also be a loss of scrub and bog woodland to facilitate the bat buffer zones around the Proposed Turbines. The Proposed Project will result in the small loss of approximately 180m of treeline habitats.

As part of the construction phase, peat and spoil excavated for the Proposed Project will require management within the Proposed Wind Farm site (Appendix 4-3 Peat and Spoil Management Plan). There will be no loss of peat and spoil from the Land, Soils and Geology Study Area (as defined in Section 8.2.1 of Chapter 8) as peat and spoil will be relocated and stored within the designated peat and spoil areas. The Proposed Project design (including placement of peat and spoil) has been purposefully designed to avoid suitable habitat for key species (i.e., marsh fritillary) and areas of uncut raised bog. There is a negative, slight, permanent residual interaction between biodiversity with land and soils, due to the disturbance and relocation of peat and subsoils within the Proposed Wind Farm site.

Operational Phase

During the operational phase the interaction between Biodiversity and Land Soils and Geology will be limited to the implementation/maintenance and monitoring of the Proposed Enhancement Areas; there are no groundworks proposed during operation that would negatively impact habitats or land soils and geology.

The residual interaction with land and land use (i.e., the land upon which the Proposed Enhancement Areas will occur) will vary as the Proposed Enhancement Areas establishes over time. Due to the provision of drain blocking, peatland enhancement areas, native tree (woodland and scrub) planting areas, as part of the Proposed Enhancement Areas, there will be an overall positive, moderate, long-term residual interaction on land and land use at the Project Site and associated habitats.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

Biodiversity and Water

Construction Phase

Activities during the construction phase of the Proposed Project may have the potential to give rise to water pollution, and consequential indirect effects (such as disturbance and deterioration of habitat quality) on flora and fauna that use that water within the same catchment.

The residual interaction between biodiversity and water arises principally from the construction of infrastructure within the extensive existing drainage network at the Proposed Wind Farm site, works associated with watercourse crossings, and construction activities with the potential to generate sediment-laden runoff or other pollutants. The Proposed Wind Farm infrastructure will cross watercourses at 15 no. locations, most notably the Figile River which supports sensitive aquatic species. The Proposed Grid Connection underground electrical cabling route crosses a total of 11 no. watercourse, however there will be no in-stream works required, as such, there is no potential for direct disturbance and mortality of aquatic species.

There is an extensive network of drains already existing at the Proposed Wind Farm site. The existing drainage infrastructure is operating in accordance with IPC licence requirements (P0503-01), with environmental monitoring and silt control measures being implemented. The existing drainage system at the Proposed Wind Farm site will be maintained and expanded locally as required for use within the Proposed Project construction phase drainage system. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including wind farm related silt traps and settlement ponds. A number of manmade peat drains within the Proposed Wind Farm site will be crossed by the Proposed Project infrastructure and require culverting, however as identified above these are highly modified in nature, subject to heavy siltation, and support poor-quality aquatic habitat.

The construction phase of the Proposed Project will require activities including ground excavations, piling, cement usage, tree felling, excavation dewatering, construction of new or replacement of existing watercourse crossing infrastructure, horizontal direction drilling under an existing watercourse and use of fuel powered machinery, all of which have potential to result in deterioration of water quality as a result of run-off of pollutants to surface waters (drains and watercourses) or percolation of pollutants to groundwater. These represent potential indirect effects on aquatic habitats and sensitive aquatic species downstream of the Project Site in the form of water quality deterioration and subsequent habitat degradation and disturbance of sensitive aquatic species downstream of construction activities.

With the implementation of the drainage, pollution-prevention and watercourse-crossing measures set out in Section 9.5.2 of Chapter 9: Water, together with the species and habitat protection measures set out in Section 6.4.2 of Chapter 6: Biodiversity and the CEMP (Appendix 4-4), the residual interaction between Water and Biodiversity during construction will be negative, imperceptible and temporary.

Operational Phase

Activities during the operational phase of the Proposed Project may have the potential to impact on the water quality and fish stocks of downstream water with consequential indirect effects (such as disturbance and deterioration of habitat quality) on flora and fauna that use that water within the same catchment.

Progressive replacement of the peat or vegetated surface with impermeable surfaces could potentially result in an increase in the proportion of surface water reaching the surface water drainage network. This could potentially increase discharge rates from the Project Site and increase flood risk downstream of the Proposed Project. In reality, the internal site access roads at the bogs comprising the Proposed Wind Farm and the Proposed Onsite Substation will have a higher permeability than the underlying peat. During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and impact on aquatic ecosystems. Therefore, there would be a negative slight temporary residual interaction with biodiversity following any increase in the proposed of surface water reaching the drainage network.

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works. These minor activities could, however, result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies. During such maintenance works there is also a small risk associated with release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on-site during the operational phase. Therefore, under a precautionary approach, a temporary, imperceptible negative residual interaction will occur between silt-laden run-off and downstream fish stocks / aquatic receptors.

Placed concrete in turbine bases and foundations can also have minor local effects on groundwater quality over time. However, due to the limited surface area of exposed concrete, the anoxic conditions below ground, and the high rate of dilution from the wider groundwater system relative to the small volumes of groundwater that would come in contact with the concrete, the potential residual interaction with biodiversity is considered to be short-term, negative and imperceptible.

The elements of the BMP (Appendix 6-5) will include a range of biodiversity enhancement and offsetting measures which have the potential to interact positively with the local hydrological regime. The drainage design for the Proposed Project has taken the measures contained within the BMP into consideration from a drainage perspective.

The proposed measures include the creation of two permanent waterbody enhancement areas for Whooper Swan within Lodge Bog, measuring approximately 7.8ha and 5.6ha. These areas are located within existing wetland areas which have already undergone drain blocking and the cessation of water pumping. Controlled flooding is proposed to provide water during the winter months, with water levels managed through drop-board sluices. Water levels will be lowered during the summer months to encourage revegetation. Elsewhere, drain blocking and rewetting are proposed as part of the Scrub Mosaic Creation Area, Lodge Bog Enhancement area, Killina Bog Offsetting Area and Peatland Enhancement Area. The objective of the peatland drain-blocking and rewetting measures is to re-establish water levels at the bog surface, where possible, and increase the extent of favourable conditions for the establishment of raised bog vegetation. Hydrological management measures, including overflow pipes, will be used where required to manage water levels and prevent excessively deep-water conditions. As such, the Proposed Enhancement Areas will have a direct positive moderate, permanent residual interaction with the hydrological environment through controlled flooding, drain blocking, rewetting and water-level management, while supporting the creation and enhancement of habitats for Whooper Swan, breeding waders, Golden Plover and peatland habitats.

Overall, the operational phase gives rise to both negative and positive interactions between Water and Biodiversity. Potential negative residual interactions associated with operational drainage, maintenance activities and water quality are negative, imperceptible, and long-term following implementation of the measures set out in Section 9.5.3 of Chapter 9. Separately, the hydrological management measures associated with the Proposed Enhancement Areas will give rise to a permanent, moderate and positive residual interaction with Biodiversity through the creation, restoration and enhancement of aquatic, wetland and peatland habitats.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational and decommissioning phase is Not Significant.

Biodiversity (including Birds) and Air Quality

Construction Phase

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the Project Site will have the potential to be a nuisance to flora and fauna (including birds).

There is potential for the construction works at the Proposed Wind Farm, given the scale of the Proposed Project and nature of the works, to generate large amounts of dust during the construction phase which in turn could lead to dust deposition impacting sensitive receptors. High sensitivity ecological receptors as discussed in Section 10.3.2.2 of Chapter 10: Air Quality include: Raised Bog, Red-Listed Plant Species, Marsh Fritillary suitable habitat, Cutover Bog Habitat, as well as the Long Derries SAC, the Grand Canal pNHA, Crabtree River, Killinthomas Wood and Ballynafagh Lake SAC. The potential effects of dust from the construction phase of the Proposed Project are considered to be to have a short-term, slight, negative residual interaction with the high sensitivity ecological receptors.

Operational Phase

During the operational phase of the Proposed Project, vehicular and dust emissions within and around the Project Site will have the potential to negatively impact on to flora and fauna (including birds).

During the operational phase, the potential for effects on biodiversity from vehicular and dust emissions are long-term, imperceptible, and negative, however the overall displacement of fossil fuel emissions resulting from the operation of the Proposed Project will have a long-term significant positive effect on air quality and therefore an indirect long-term slight positive effect on biodiversity (including birds).

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Biodiversity (including Birds) and Climate

Construction Phase

During the construction phase of the Proposed Project, greenhouse gas emissions associated with construction phase activities within and around the Project Site will have the potential to be a nuisance to flora and fauna (including birds).

The construction of the Proposed Project will result in greenhouse gas emissions associated with vegetation removal, production of Proposed Project infrastructure and construction materials, and operation of vehicles and plant. As well, the Proposed Project infrastructure footprint will result in the loss of carbon fixing vegetation

within the Project Site, however, that has been avoided where possible by the design and layout of the Proposed Project.

During the construction phase, there will be a short-term, negative and slight residual interaction between climate and biodiversity (including birds), given the quantity of greenhouse gases that will be emitted to the atmosphere and loss of carbon sequestering habitat present within the Proposed Wind Farm site. Once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible, negative effect on climate and therefore biodiversity.

Operational Phase

During the operational phase, the interaction between Biodiversity and Climate relates primarily to the reduction in greenhouse gas emissions resulting from the generation of renewable electricity and the consequent reduction in reliance on fossil fuel-based electricity generation.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Wind Farm are the release of carbon dioxide to the atmosphere due to maintenance and monitoring activities, including the removal of carbon fixing vegetation and habitat, as well as peat reinstatement and associated drainage.

However, as the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year operational lifespan due to the provision of clean renewable energy to the national grid, consequently, in combination with other renewable energy projects, the Proposed Project will have a long term, significant positive effect on climate and therefore an indirect long-term slight positive effect on biodiversity (including birds).

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Biodiversity and Noise and Vibration

Construction Phase

Site activity during the construction phase could give rise to noise that could be a nuisance for fauna, which use the Project Site.

Best practice mitigation measures are included in Section 6.4.2 of Chapter 6: Biodiversity and Section 12.7.1 of Chapter 12: Noise and Vibration and the CEMP (Appendix 4-4) to minimise the potential negative effect of noise generated during the construction phase on biodiversity. Under a precautionary scenario there will be a short-term imperceptible negative residual interaction between noise and vibration and biodiversity.

Operational Phase

Site activity during the operational phase could give rise to noise that could be a nuisance for fauna, which use the Project Site.

Based on detailed information on the site layout, turbine noise levels have been predicted at NSLs for a range of operational wind speeds. The predicted noise levels associated with the Proposed Project will be within the best practice noise limits recommended in WEDG 2006.

The limited onsite noise activity generated by the Proposed Project during the operational phase will have a long-term, not-significant, negative residual interaction with biodiversity.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

18.2.3 Birds

Birds and Land, Soils and Geology

Construction Phase

The construction of the Proposed Project will involve excavation works and the movement and management of peat and spoil, which may present a potential risk of soil and ground contamination and associated effects on birds.

The Proposed Project will incorporate measures to ensure that excavated peat and subsoil are managed entirely within the Project Site. Materials will be deposited within the proposed peat and spoil areas or reused for landscaping. Accordingly, there will be no likelihood of disturbance to flora and fauna, including birds, in areas surrounding the Proposed Project works.

As part of the construction phase, peat and spoil excavated for the Proposed Project will require management within the Proposed Wind Farm site (Appendix 4-3 Peat and Spoil Management Plan). There will be no loss of peat and spoil from the Land, Soils and Geology Study Area (as defined in Section 8.5.2.2 of Chapter 8) as peat and spoil will be relocated and stored within the designated peat and spoil areas. There is a negative, slight, permanent residual interaction between birds with land and soils, due to the disturbance and relocation of peat and subsoils within the Proposed Wind Farm site.

Proposed Enhancement Areas relating to ornithological enhancement and offsetting are detailed above in Section 18.2.2 '*Biodiversity and Birds*'. Measures are proposed to offset habitat loss and create new permanent suitable habitat for KORs. During the proposed works, mitigation measures will be implemented for the protection of the land, soils and geological environment the Proposed Enhancement Areas are located in Section 8.5.2.2, 8.5.2.3 and Section 8.5.2.4 of Chapter 8 and Appendix 6-5 BMP. Implementation of these measures will result in the disturbance and relocation of peat and subsoils within the Proposed Wind Farm site. Therefore, the residual interaction effecting on land soils geology and birds during the construction phase of the Proposed Project will be short-term, negative and slight.

Overall, is considered that there will be a long-term, negative, slight residual interaction between birds and land altering activities.

Operational Phase

During the operational phase the interaction between Birds and Land Soils and Geology will be limited to the implementation/maintenance and monitoring of the Proposed Enhancement Areas; there are no groundworks proposed during operation that would negatively impact birds or land soils and geology.

Proposed Enhancement Areas relating to ornithological enhancement and offsetting are detailed above in Section 18.2.2 '*Biodiversity and Birds*'. Measures are proposed to offset habitat loss and create new permanent suitable habitat for KORs. As measures proposed in Killina Bog and Lodge Bog (as outlined above) will increase habitat suitability for KORs within these locations, i.e., away from the Proposed Turbines, the Proposed Enhancement Areas will result in a positive, slight, long-term residual interaction between habitat suitability and birds.

As outlined in Section 4.3 and 4.4 of Appendix 6-5 BMP the enhancement of Lodge Bog, the creation of habitat is proposed at Killina Bog, the removal of forestry and the blocking of drain and rewetting of land will create a positive residual interaction between land and soils and birds

Therefore, the residual interaction between Birds and Land, Soils and Geology is anticipated to be positive, slight and long-term during the operational phase.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during construction, operational, and decommissioning is Not Significant.

Birds and Water

Construction Phase

Activities during the construction phase of the Proposed Project may have the potential to give rise to water pollution, and consequential indirect effects (such as disturbance and deterioration of habitat quality) on birds that use that water within the same catchment.

Site activities during the construction phase of the Proposed Project may have the potential to give rise to some water pollution, and consequential short term indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use that water within the same catchment. With the implementation of mitigation and monitoring measures outlined in Section 7.5 of Chapter 7: Birds, Section 9.5.2 of Chapter 9: Water and the CEMP (Appendix 4-4), there will be no residual interacting effect on aquatic habitats or species as a result of the Proposed Project.

Drain blocking, reprofiling and infilling will be undertaken to facilitate the Proposed Enhancement Areas described in the BMP (Appendix 6-5), with the detailed measures pertaining to ornithology outlined in Section 18.2.2 '*Biodiversity and Birds*' above. During the proposed works, mitigation measures will be implemented for the protection of the hydrological environment the Proposed Enhancement Areas are located in Section 9.5.2.19 of Chapter 9 and Appendix 6-5 BMP. Implementation of these measures will result in the disturbance and relocation of peat and subsoils with potential to deteriorate water quality within the Proposed Wind Farm site. Therefore, the residual interaction effecting on water and birds during the construction phase of the Proposed Project will be short-term, negative and imperceptible.

During the construction phase, earthworks associated with the construction of the Proposed Wind Farm and Proposed Grid Connection have the potential to generate sediment-laden runoff. This could increase turbidity and affect the water quality and fish stocks of downstream watercourses and water-dependent ecosystems.

Hydrocarbon spills, cement-based products, excavation dewatering, wastewater, tree felling and vegetation removal could also affect surface water or groundwater quality. These effects have the potential to interact with birds, as the Core Ornithology Survey Area contains an extensive network of steep-sided bog drains analogous to suitable nesting habitat for the species. However, the majority of construction works will be set back from the principal drains and rivers, an extensive network of suitable bog drains will remain, and substantial areas of undisturbed habitat will continue to be available during construction. Hydrological mitigation includes 50-metre buffer zones from main watercourses, 10-metre buffer zones from main drains, and measures to control sediment-laden runoff and accidental pollution. Therefore, under a precautionary scenario, the residual interaction will be a temporary, negative and imperceptible.

The overall residual interaction between Water and Birds will be temporary, imperceptible, and negative.

Operational Phase

Activities during the operational phase of the Proposed Project may have the potential to impact on the water quality and fish stocks of downstream water with consequential indirect effects (such as disturbance and deterioration of habitat quality) on birds that use that water within the same catchment.

During the operational phase, the Proposed Project infrastructure footprint could increase surface-water runoff rates and the velocity of flow, potentially resulting in erosion and effects on water quality. Minor and infrequent maintenance of site entrances, internal site access roads, hardstanding areas and amenity tracks could also generate small quantities of sediment-laden runoff or result in the accidental release of hydrocarbons from maintenance vehicles. These effects have the potential to interact with water-dependent bird species, particularly Kingfisher and Little Egret, which use or commute along linear waterbodies such as bog drains, large drainage ditches and rivers. However, the potential for silt-laden runoff will be substantially reduced following construction, ground disturbance and excavation works will be complete, and the permanent drainage controls will be operational. Chapter 7 Section 7.5.2 concludes that the Proposed Wind Farm will not hinder the commuting corridors of Kingfisher or Little Egret and that no change to their foraging or potential nesting habitats is likely during operation; therefore, there will be a temporary imperceptible negative residual interaction between birds and water quality effects.

During the operational phase, Proposed Enhancement Areas as outlined in Section 18.2.2 '*Biodiversity and Water*' will be implemented (i.e., enhancement in Killina and Lodge Bog for ornithological habitat creation). Implementation of these measures will result in a positive effect on the local hydrological regime, providing water attenuation and slowing the release of water from the Project Site. Therefore, the residual interaction from the Proposed Enhancement Areas on water and birds during the operational phase of the Proposed Project will be permanent, moderate and positive.

Overall, the operational phase gives rise to both negative and positive interactions between Water and Birds. Potential negative residual interactions associated with increased surface water runoff and water quality are temporary and imperceptible following implementation of the measures set out in Section 9.5.3 of Chapter 9. Separately, the hydrological management measures associated with the Proposed Enhancement Areas will give rise to a permanent, moderate and positive residual interaction with Birds through the creation, restoration and enhancement of aquatic, wetland and peatland habitats.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation, and decommissioning phase is Not Significant.

Birds and Noise and Vibration

Construction Phase

Activity during the construction phase could give rise to noise that could be a nuisance for birds, which use the Project Site.

Best practice mitigation measures are included in Section 7.6 of Chapter 7: Birds and Section 12.7 of Chapter 12: Noise and Vibration and the CEMP (Appendix 4-4) to minimise the potential negative effect of noise generated during the construction phase. Under a precautionary scenario there will be a short-term imperceptible negative residual interaction between noise and vibration and birds.

Operational Phase

Site activity during the operational phase could give rise to noise that could be a nuisance for birds, which use the Project Site.

The limited onsite noise activity generated by the Proposed Project during the operational phase will have a long-term, not-significant, negative residual interaction with birds.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

18.2.4 Land, Soils and Geology

Land, Soils and Geology and Water

Construction Phase

Activities during the construction phase of the Proposed Project may have the potential to give rise to interactions between Land, Soils and Geology and Water, principally through the excavation, disturbance and relocation of peat and subsoil and the consequential potential for sediment-laden runoff to enter the existing surface water drainage network.

During the construction phase, small scale temporary dewatering may occur at some excavations (i.e. turbine bases, cable trenches), and these have the potential to affect local groundwater levels. However, temporary reductions in groundwater levels by temporary dewatering will be very localised and of small magnitude due to the nature and permeability of the local peat and subsoil geology, which comprises moderate to low permeability lacustrine and glacial deposits. Therefore, there will be a temporary negative imperceptible effect on groundwater during the construction phase.

Construction phase activities will require varying degrees of earthworks resulting in excavation of peat and mineral subsoil, where present. These activities can result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load. Furthermore, excavation works can have an eroding effect on peat and spoil with the potential for some eroded subsoils to reach watercourses, leading to water quality issues such as high turbidity. Following implementation of mitigation outlined in Section 8.5.2 of Chapter

8: Land, Soils and Geology, and Section 9.5.2 of Chapter 9: Water, there will be a negative, slight, short-term effect on peat and subsoils and water quality.

There is an extensive network of drains already existing at the Proposed Wind Farm site. The existing drainage infrastructure is operating in accordance with IPC licence requirements (P0503-01), with environmental monitoring and silt control measures being implemented. The existing drainage system at the Proposed Wind Farm site will be maintained and expanded locally as required for use within the Proposed Project construction phase drainage system. The Proposed Project will interact with the existing site drainage network and cross a total of 26 no. water courses (15 no. by the Proposed Wind Farm and 11 no. by the Proposed Grid Connection underground electrical cabling route). This interact present a potential risk on surface water flows, local stream morphology and surface water quality. Following mitigation outlined in Section 9.5.2.8 and Section 9.5.2.9 of Chapter 9 there will be a negative, imperceptible, long-term effect on water quality and the Proposed Wind Farm site drainage network.

The overall residual interaction between Land Soils and Geology and Water will be long-term, slight and negative.

Operational Phase

During the operational phase, the principal interaction between Land, Soils and Geology and Water relates to the presence of permanent infrastructure within the peatland and the potential for changes to surface-water runoff, together with minor maintenance activities which could result in localised sediment mobilisation or accidental hydrocarbon release.

The permanent infrastructure has the potential to result in a small change in surface-water runoff, while minor and infrequent maintenance works within the Project Site could result in the generation of small quantities of sediment-laden runoff. Site vehicles may also present a small risk of accidental hydrocarbon release. However, the proposed operational phase drainage system will incorporate additional attenuation and treatment, with the assessment indicating a potential reduction in overall site runoff volumes where the proposed drainage controls are considered. The operational drainage system will therefore manage runoff from the permanent infrastructure prior to discharge to the existing bog drainage network. Following implementation of mitigation as outlined in Section 8.5.3 of Chapter 8 and Section 9.5.3 of Chapter 9, the residual effects of pertaining to sediment run-off, hydrocarbon leaks on Water and Land Soils and Geology is negative, imperceptible, and temporary.

The Proposed Enhancement Areas, as outlined in Section 18.2.2 above, will support peatland rehabilitation within the Proposed Wind Farm site. The proposed drain blocking and creation of wetland/waterbody habitats will result in increased water retention and attenuation within parts of the Proposed Wind Farm site, resulting in wetter conditions and supporting the transition of the peatlands towards more rehabilitated conditions. Therefore, the residual interaction from the Proposed Enhancement Areas on Water and Land Soils and Geology during the operational phase of the Proposed Project will be permanent, moderate and positive.

Overall, the operational phase gives rise to both negative and positive interactions between Water and Land Soils and Geology. Potential negative residual interactions associated with increased surface water runoff and hydrocarbon release are temporary and imperceptible following implementation of the measures set out in Section 8.5.3 of Chapter 8 and Section 9.5.3 of Chapter 9. Separately, the hydrological management measures associated with the Proposed Enhancement Areas will give rise to a permanent, moderate and positive residual interaction with Land Soils and Geology through drain blocking and rewetting measures which will rehabilitee the peatlands present on site.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational and decommissioning phase is Not Significant.

Land, Soils and Geology and Air Quality

Construction Phase

The construction of the Proposed Project will give rise to dust emissions during the construction phase. The removal of the topsoil followed by its transportation and deposition at the peat and spoil areas during the construction phase will also give rise to dust emissions. Following the implementation of mitigation measures, outlined in Section 10.3.2 of Chapter 10: Air Quality, including dust suppression measures which is further outlined in the CEMP (Appendix 4-4), the residual interaction on Air Quality and Land Soils Geology is considered to be negative, temporary and imperceptible.

Operational Phase

No anticipated interactive effect.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction and decommissioning phase is Not Significant. There is no identified interaction during the operational phase.

Land, Soils and Geology and Climate

Construction Phase

Bogs and peatlands are known to store large amounts of carbon. Due to the waterlogged nature of these habitats, stored carbon is not broken down and released into the atmosphere. The construction of wind farms on bog and peat habitats may affect the natural hydrological regime, thus exposing and drying out the peat and allowing the decomposition of carbon. During the construction phase of the Proposed Project, excavation activities have the potential to release carbon due to disturbance of the above-described habitats which are the predominant land use within the Project Site.

The Proposed Project permanent infrastructure footprint will result in the permanent loss of cutover bog, immature woodland and scrub which will be replaced by turbine foundations, hardstand areas, access roads and other related infrastructure. The Proposed Project construction works will also result in local topographic changes with the removal of overburden and bedrock. The Proposed Offsite Substation and associated new proposed access road will result in the loss of agricultural land.

As outlined in Section 11.4.3.1 of Chapter 11: Climate, the Proposed Project permanent footprint represents 2.9% of the area of the Proposed Wind Farm site and 2.9% of the Project Site. Due to the relatively small footprint of the Proposed Project infrastructure on a site scale and even more so on a local scale the residual effect is considered to be a negative, moderate, and long-term effect on land and land use. Once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities and loss of carbon sequestrating habitat will have a permanent slight negative residual interaction with Land Soils and Geology.

Operational Phase

During the operational phase, the interaction between Land Soils Geology and Climate relates primarily to the rehabilitation of the Proposed Wind Farm site under targeted rehabilitation (i.e., the Draft Rehabilitation Plans) and the Proposed Enhancement Areas.

Though no significant land altering activities will take place during the operational phase, the change of land-use within the Proposed Project site has the potential to impact the climate. As outlined in Section 11.4.3.1 of Chapter 11: Climate, the Proposed Project permanent footprint represents 2.9% of the area of the Proposed Wind Farm site and 2.9% of the Project Site. The loss of carbon sequestration potential from peatland within the permanent infrastructure footprint is assessed in Table 11-9. This assessment identifies that the 152ha footprint will result in a loss of approximately 3% (or 1,824 tCO_2eq) of potential emission reductions per annum over the 35-year operational life of the Proposed Wind Farm.

However, on a site scale, the removal of 152ha from the Proposed Wind Farm site will leave approximately 97% of the Proposed Wind Farm site available for rehabilitation. This area of peatland has the potential to result in approximately 59,844tCO_2eq of carbon savings per annum over the 35-year operational life of the Proposed Wind Farm.

The Proposed Wind Farm site will be rehabilitated as per the requirements of the IPC Licence following completion of the construction phase. The peatland enhancement measures within the Proposed Enhancement Areas, implemented during construction, will continue to raise the water table during the operational phase, promoting further rewetting and revegetation of the Proposed Wind Farm site.

Furthermore, over its 35-year operational life the Proposed Project will displace carbon dioxide emissions from fossil fuel-based electricity generation. The loss of carbon sequestration potential arising from the Proposed Project permanent infrastructure footprint is equivalent to less than 1.5% of the carbon savings associated with the generation of renewable electricity by the Proposed Project. This loss will therefore be offset by the operation of the Proposed Wind Farm.

The direct residual interaction between Land, Soils and Geology and Climate, arising from the loss of carbon-sequestering peatland habitat, will be a long-term, slight, negative effect. However, the Proposed Project will make a long-term, significant, positive contribution to climate due to the provision of renewable energy to the national grid. As climate change is a recognised pressure on peatland ecosystems, this will indirectly benefit peatland habitats, including those being rehabilitated within the Proposed Wind Farm site. Overall, the residual interaction between Land, Soils and Geology and Climate during the operational phase is considered to be long-term, moderate and positive.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

Land, Soils and Geology and Cultural Heritage

Construction Phase

During construction, physical impacts arising from site clearance, excavation, and construction activities associated with the Proposed Project has the potential to effect cultural heritage receptors.

The majority of recorded monuments within the Cultural Heritage Study Area (defined in Section 14.2.1 of Chapter 14: Cultural Heritage have been avoided by design, meaning that the Proposed Project layout was

designed to avoid the known locations of these monuments. A variety of monument types are located within the Proposed Wind Farm site but are typical of those found in a peatland environment which largely comprise roads (trackways or toghers of either stone or wood), and structures – peatland. Archaeological monitoring of ground works associated with the proposed new amenity track extending northeast from T46 where such works interact with the location of recorded monument KD012-002001- and were associated with the Proposed Grid Connection where it extends through the ZoN for KD013-017— Ringfort – rath will be undertaken.

The rich archaeological heritage of the Cultural Heritage Study Area is evidenced by the recorded monuments therein and the large number of archaeological objects recovered from the bogs within and surrounding the part of the Proposed Wind Farm site over its lifetime as an industrial peat extraction site. It is noted, however, that the number of recorded monuments within the Proposed Wind Farm site is low, particularly for a peatland environment (see Section 14.3.2.1.3 and Section 14.3.2.1.4 in Chapter 14). Notwithstanding this, bogs are renowned for their archaeological potential and the preservation of organic structures and objects. The presence of a large number of stray finds from the area suggests that there is still potential for the presence of additional archaeological finds, features and structures within the peat, particularly where deep peat remains in situ.

The excavation of peat for the construction of the Proposed Project infrastructure within the Proposed Wind Farm site has the potential to directly affect such sub-surface finds, structures and deposits should they exist. Any archaeological features or sites, if detected during the testing or monitoring will be preserved by record (archaeologically excavated) or preserved in-situ (avoidance) and therefore a full record made of same. In this regard, the residual interaction between land soils and geology and cultural heritage under a precautionary scenario is considered to be long-term, slight and negative.

Operational Phase

During the operational phase, there is no potential for interaction between cultural heritage and land soils and geology as there will be no groundworks or excavations associated with this phase.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction is Not Significant during the construction and decommissioning phases. There is no identified interaction during the operational phase.

Land, Soils and Geology and Landscape and Visual

Construction Phase

The removal of peat and spoil and the subsequent replacement with crushed stone for the construction of the site roads and hardstanding areas within the Proposed Wind Farm site has the potential to alter the local landscape.

Where excavation is required, the existing landcover, vegetation, peat and spoil will be removed during the construction phase. In most instances, groundworks and excavation trenches will be re-instated upon completion of the construction phase. Where peat and spoil arising from construction activities is managed within the Project Site, the vegetative top-soil layer will be removed and reinstated following the completion of works. All remaining peat and spoil will be transported to the designated peat and spoil areas or landscaped locally to the Proposed Project infrastructure.

Construction activities have the potential to affect the landscape through minor soil erosion, minor alterations to drainage patterns and the temporary presence of exposed peat and spoil stockpiles. In addition, the landscape

character of the Proposed Wind Farm site has already been substantially modified by historical industrial peat extraction, which reduces its sensitivity to further ground disturbance and landscape effects. Therefore, the residual interaction between Land, Soils and Geology and landscape effects during the construction phase will be short-term, moderate and negative.

In relation to visual effects, the primary visual effects during the construction phase will occur as a result of the construction of the Proposed Turbines and the ancillary infrastructure such as roads and hardstands to service, as well as the Proposed Onsite Substation, and Proposed Offsite Substation. These effects do not arise from the residual interaction with Land, Soils and Geology. The earthworks associated with Land, Soils and Geology, including excavations, stockpiles and the placement of peat and spoil, will be low-lying in nature. Owing to the flat topography of the Proposed Wind Farm site and the screening provided by existing boundary vegetation, these works will be visible only from the immediate vicinity of the Project Site. Under a precautionary scenario, the residual interaction between Land, Soils and Geology and visual effects during the construction phase will be short-term, slight and negative.

Operational Phase

No identified interaction.

Decommissioning Phase

No identified interaction.

On this basis, the identified interaction during the construction phase is Not Significant. There is no identified interaction during the operational or decommissioning phase.

18.2.5 Water

Water and Climate

Construction Phase

During the construction phase, the interaction between Water and Climate relates primarily to the potential for construction drainage and dewatering to lower the water table within the Proposed Wind Farm site, resulting in the oxidation of peat and the release of stored carbon, and, to the potential for extreme rainfall events to increase surface water runoff and sediment loading from areas of exposed peat and spoil.

Much of the carbon loss associated with drainage has therefore already occurred. Any additional lowering of the water table during construction will be localised to the immediate area of excavations and limited to the duration of the works. Consequently, the potential for further peat oxidation and associated carbon emissions arising from construction dewatering is considered negligible.

The risk of increased runoff and sediment loading during extreme rainfall events will be managed through the surface water management and drainage measures set out in the Surface Water Management Plan (Appendix 4-6). These measures have been designed to accommodate increased rainfall intensity in line with climate change allowances.

Therefore, the residual interaction between Water and Climate during the construction phase will be short-term, imperceptible and negative.

Operational Phase

During the operational phase, the interaction between Water and Climate will focus on the increased flood risk resulting from higher winter rainfall and more intense rainfall. Over the operational life of the Proposed Wind Farm, this could affect flood risk at the Project Site.

Chapter 9: Water and the accompanying Site-Specific Flood Risk Assessments (SSFRA) (Appendix 9-1 and Appendix 9-2) detail the flood risk of the Proposed Project. The SSFRA identifies that climate change is likely to have significant impacts on flooding and flood risk in Ireland, due to rising sea levels, increased winter rainfall and more intense rainfall. Construction works located within mapped flood zones may therefore be exposed to fluvial flood risk.

The OPW's National Indicative Fluvial Flood Mapping (NIFM) shows that parts of the Proposed Wind Farm site lie within the medium-probability 1-in-100-year, and low-probability 1-in-1,000-year fluvial flood zones associated with the Figile River and its tributaries. Approximately 7,821m² of Proposed Wind Farm infrastructure is mapped within the 1-in-100-year zone, and a further approximately 25,163m² within the 1-in-1,000-year zone.

The remainder of the Proposed Wind Farm and all other Proposed Project infrastructure is in Fluvial Flood Zone C and is considered low risk. The Proposed Onsite Substation is not within any mapped fluvial flood zone.

The Catchment Flood Risk Assessment and Management (CFRAM) Programme modelled a Mid-Range Future Scenario (20% rainfall increase) and a High-End Future Scenario (30% increase). NIFM mapping has also been modelled for both scenarios. CFRAM mapping has been completed for the Figile River to the west of the site and the Slate River to the south and southeast. Under the present-day scenario, the mapped flood zones along the Slate River bound the southeastern boundary of Lodge Bog but do not encroach on the Proposed Wind Farm site. The Figile River flood zones are approximately 1.1km west of the site at their closest point. The long-term plan for the Proposed Wind Farm site is to retain and slow down drainage from the bogs, and the Proposed Project is designed and laid out in a manner that reduces flood risk. No CFRAM flood zones are mapped in the area of the Proposed Turbine Delivery Route accommodation works. The nearest, associated with the Daingean River, is approximately 130m to the west.

The FRA concludes that the overall risk of flooding at the Project Site is low. Furthermore, volumetric analysis has shown that the emplacement of the proposed infrastructure within the flood zones has no potential for significant effects and will only result in minor increase in flood water levels within the Proposed Wind Farm site. The cutover bogs comprising the Proposed Wind Farm are flat and extensive and have sufficient capacity to buffer the effect of any displaced floodwater.

Therefore, the residual interaction between Water and Climate will be negative, imperceptible, and brief.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

18.2.6 Air Quality

Air Quality and Material Assets

Construction Phase

During the construction phase, the transportation of vehicles to/from and around the Project Site will give rise to dust emissions and exhaust emissions. Following implementation of mitigation measures as outlined in Section 10.3.2 of Chapter 10: Air Quality, and Section 15.1.18.5 Chapter 15: Material Assets and the CEMP (Appendix 4-4) there will be a short-term, imperceptible, negative residual interaction with air quality and material assets resulting from traffic and transport activities.

There is no potential for built assets or telecommunications to interact with air quality during the construction phase.

Operational Phase

During operation of the Proposed Project, dust and exhaust emissions from minor maintenance and monitoring activities and transport to and from the Project Site have the potential to impact air quality.

The effects on air quality due to dust and exhaust emission will be negligible during the operational phase given that there will only be an average of approximately 1 to 2 trips made to the Proposed Wind Farm by car or light goods vehicle (LGV) per day. In addition to this amenity visitors will visit the Proposed Wind Farm site, the anticipated number of LGVs visiting the Proposed Wind Farm during the operational phase (up to a maximum of 50 car trips per day), across 4 no. new permanent amenity carparks. There will be no regular visits required for the Proposed Grid Connection. The residual interaction between maintenance and amenity traffic and air quality will therefore be imperceptible, negative and long term.

As the Proposed Project has the potential to supply 322MW of renewable electricity generation to the national electricity network, improving the resilience and diversity of electricity supply while reducing dependence on fossil fuel-based generation. This also contributes to reductions in emissions, providing associated air quality benefits.

Overall, the residual interaction between material assets and air quality is considered to be long-term, slight, and positive during the operational phase due to the offsetting of greenhouse gas emissions that will occur during the operational phase of the Proposed Project.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration

On this basis, the identified interaction during the construction, operational, and decommissioning phase is Not Significant.

18.2.7 Climate

Climate and Material Assets

Construction Phase

During the construction phase, the transportation of vehicles to/from and around the Project Site will give rise to greenhouse gas emissions associated with transport of Proposed Project infrastructure, construction materials and site staff.

The transport of turbines and construction materials to the Project Site, which will occur on specified routes only (i.e., Proposed Construction Haul Routes and Proposed Turbine Delivery Route) will give rise to 3,369 tCO_2eq associated with the transport vehicles and exhaust emissions as outlined in Table 11-8 in Chapter 11,

representing 0.4% of total carbon losses as outlined in Section 11.4.3.1 of the same. For transporting construction materials, 9 no. existing, authorised quarries, located within 20km of the Project Site have been selected which will be utilising the Proposed Construction Haul Routes which encompasses National, regional and local roads. Turbine blades and towers being imported indicatively to Galway Port will be delivered to the Project Site utilising the Proposed Turbine Delivery Route which comprises of M6, N52 and other regional roads and then through the entrance of the existing Cloncreen Wind Farm.

The residual interacting effect between material assets and climate will therefore be short-term, negative and slight.

Operational Phase

During the operational phase, the interaction between Material Assets and Climate relates primarily to the reduction in greenhouse gas emissions resulting from the generation of renewable electricity and the consequent reduction in reliance on fossil fuel-based electricity generation

During the operational phase, the Proposed Project will displace 146,857 tonnes of carbon dioxide per annum or 5,139,995 tonnes over its operational life from traditional carbon-based electricity generation. Therefore, while there will be 949,630 tonnes of CO_2eq lost to the atmosphere due to the construction and operation of the Proposed Project will be offset by the Proposed Wind Farm in approximately **77** months (6.4 years) of operation. Therefore, the overall residual interaction between material assets and climate will be long-term significant and positive effect.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration.

On this basis, the identified interaction during the construction and decommissioning phase is Not Significant. The identified interaction during the operational phase is Significant and Positive.

18.2.8 Landscape and Visual

Landscape and Visual and Cultural Heritage

Construction Phase

The construction phase of a development will consist of earthmoving activities such as topsoil/peat removal and excavation works as part of the construction phase. These activities have the potential to effect the known and potential archaeological heritage. Impacts on visual setting of cultural heritage are largely only possible once development is operational, therefore there is no interaction between visual effects and the construction phase identified.

The majority of recorded monuments within the Cultural Heritage Study Area (defined in Section 14.2.1 of Chapter 14) have been avoided by design, meaning that the Proposed Project layout was designed to avoid the known locations of these monuments. A variety of monument types are located within the Proposed Wind Farm site but are typical of those found in a peatland environment which largely comprise roads (trackways or toghers of either stone or wood), and structures – peatland. The Proposed Project is not located in or immediately adjacent to areas which have been designated as Archaeological Landscapes. Potential visual effects on any such landscapes will therefore not occur.

Under a precautionary approach, the residual interaction during construction between LVIA and Cultural Heritage will be short-term, imperceptible and negative.

Operational Phase

During the operational phase, the interaction between Landscape and Visual and Cultural Heritage arises from the potential visibility of the Proposed Turbines from cultural heritage receptors and the resulting changes to their wider landscape settings. The assessment was informed by the ZTV and, where available, photowires and photomontages.

Dún Ailinne, which forms part of the Royal Sites of Ireland UNESCO World Heritage Site Tentative List, is located approximately 19.9km southeast of the nearest Proposed Turbine, T1. While the ZTV indicates theoretical visibility of the majority of the Proposed Turbines, the intervening distance, topography and vegetation mean that the Proposed Turbines will not dominate the view or affect the immediate setting of Dún Ailinne.

The Proposed Turbines will not interact with the Curragh, the Hill of Allen or the monastic complex at Old Kilcullen.

No National Monuments or monuments subject to Preservation Orders are located within the Cultural Heritage Study Area. The potential visual effects on the identified National Monuments and monuments subject to Preservation Orders range from moderate to imperceptible, negative and long-term. A total of 284 no. recorded monuments, and 172 no. protected structures are located within 5km of the nearest Proposed Turbine, with 9 no. recorded monuments and no protected structures located within the Proposed Wind Farm site. The ZTV indicates that the majority of recorded monuments located in areas where 37–46 Proposed Turbines will theoretically be visible and only 9 no. protected structures located where there will be any visibility of the Proposed Turbines. Furthermore, many of these monuments, particularly peatland monuments, have little or no visible surface expression, while intervening screening will further reduce the actual visual effects.

Therefore, under a precautionary scenario, the overall interaction between the cultural heritage receptors and visual effects will be long-term, negative and moderate.

Decommissioning Phase

Any interactive impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration; with effects being deemed reversible following decommissioning of the Proposed Wind Farm.

On this basis, the identified interaction during the construction, operation and decommissioning phase is Not Significant.

18.2.9 Vulnerability to Natural Disasters

Construction, Operational and Decommissioning Phase

As described in Chapter 17: Major Accidents and Natural Disasters, major accidents or natural disasters are hazards which have the potential to affect the Proposed Project and lead to environmental effects both directly and indirectly. These include accidents during construction, operation and decommissioning of the Proposed Project caused by operational failure and/or natural hazards. The assessment of the potential for significant accidents or disasters is conducted in connection with the information that must be included in the EIAR. This includes aspects such as population and human health, biodiversity, land and soil, water, air quality, climate, material assets, cultural heritage, and the landscape. The risk of a major accident and/or disaster during the

construction of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010).

When all mitigation detailed in the EIAR is implemented and as summarised above, the residual effect(s) associated with the construction, operation and decommissioning of the Proposed Project are Not Significant.

18.3 Mitigation and Residual Effects

Where any potential interacting negative effects have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5 – 17) of the EIAR, detailed in Chapter 19: Schedule of Mitigation and Monitoring Measures and detailed in the CEMP (Appendix 4-4). The implementation of these mitigation measures will reduce or remove the potential for effects. Information on potential residual effects and the significance of effects is also presented in each relevant chapter.