

Environmental Impact Assessment Report

Lemanaghan Wind Farm,
Co. Offaly

Chapter 17 Interaction of the Foregoing



Table of Contents

17.	INTERACTION OF THE FOREGOING	17-1
17.1	Introduction.....	17-1
17.1.1	Statement of Authority.....	17-3
17.2	Impact Interactions	17-4
17.2.1	Population and Human Health.....	17-4
17.2.2	Biodiversity	17-7
17.2.3	Birds.....	17-10
17.2.4	Land, Soils and Geology.....	17-11
17.2.5	Water.....	17-13
17.2.6	Air Quality.....	17-13
17.2.7	Climate.....	17-14
17.2.8	Landscape and Visual	17-14
17.2.9	Vulnerability to Natural Disasters.....	17-15
17.3	Mitigation and Residual Effects	17-15

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
BMEP	Biodiversity Management and Enhancement Plan
CEMP	Construction and Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CO ₂	Carbon Dioxide
DoEHLG	Department of the Environment, Heritage and Local Government
FRA	Flood Risk Assessment
GWBs	Groundwater Bodies
IAQM	Institute of Air Quality Management
IRBD	Irish River Basin District
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
VP	Viewpoint
WHS	World Heritage Sites
ZTV	Zone of Theoretical Visibility

17. INTERACTION OF THE FOREGOING

17.1 Introduction

The preceding Chapters 5 to 16 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Flora and Fauna), Birds (Ornithology), 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, Aviation, Utilities and Waste Management), 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 18 (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 these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect.

A matrix is presented in Table 17-1 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. 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 17.2 below, the potential interactions between each environmental component have been discussed in order of the relevant chapters of the EIAR. Once a potential interaction between two environmental components has been discussed, 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 17-1 Interaction Matrix: Potential for Interacting Impacts

	Phase	Population and Human Health	Biodiversity	Birds	Land, Soils and Geology	Water	Air Quality	Climate	Noise and Vibration	Cultural Heritage	Landscape and Visual	Material Assets	Major Accidents and Natural Disasters
Population and Human Health	C	Black	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
	O	Black	White	White	White	White	White	White	White	White	White	White	White
Biodiversity	C	Light Blue	Black	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
	O	Light Blue	Black	White	White	White	White	White	White	White	White	White	White
Birds	C	Light Blue	Pink	Black	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
	O	Light Blue	Light Green	Black	White	White	White	White	White	White	White	White	White
Land, Soils and Geology	C	Pink	Pink	Pink	Black	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
	O	Pink	Light Blue	Light Green	Black	White	White	White	White	White	White	White	White
Water	C	Pink	Pink	Pink	Pink	Black	Grey	Grey	Grey	Grey	Grey	Grey	Grey
	O	Yellow	Light Green	Light Green	Light Green	Black	White	White	White	White	White	White	White
Air Quality	C	Pink	Pink	Pink	Light Blue	Pink	Black	Grey	Grey	Grey	Grey	Grey	Grey
	O	Light Green	Light Green	Light Green	Light Blue	Light Green	Black	White	White	White	White	White	White
Climate	C	Pink	Pink	Pink	Pink	Pink	Pink	Black	Grey	Grey	Grey	Grey	Grey
	O	Light Green	Light Green	Light Green	Pink	Yellow	Light Green	Black	White	White	White	White	White
Noise and Vibration	C	Pink	Pink	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Black	Grey	Grey	Grey	Grey
	O	Pink	Pink	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Black	White	White	White	White
Cultural Heritage	C	Light Blue	Light Blue	Light Blue	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Black	Grey	Grey	Grey
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	White	White	White
Landscape and Visual	C	Pink	Light Blue	Light Blue	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Pink	Black	Grey	Grey
	O	Pink	Light Blue	Light Blue	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Pink	Black	White	White
	C	Pink	Light Blue	Light Blue	Light Blue	Light Blue	Pink	Pink	Light Blue	Light Blue	Light Blue	Black	Grey

Material Assets	O													
Major Accidents and 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 17.2 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 16.

17.1.1 Statement of Authority

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

Catherine is a Project Environmental Scientist at MKO with over three 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.

Aisling is a graduate Environmental Scientist with MKO with over 1 year of experience in both private practice and local authorities. Aisling holds a BSc in Applied Freshwater and Marine Biology and LLM Marine and Maritime Law. Aisling has specialist knowledge in Environmental and Marine law and policy, and key strengths and areas of expertise are in conservation, animal behaviour, GIS, Marine Mammal Observer, and Legal dispute resolutions.

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.

17.2 Impact Interactions

17.2.1 Population and Human Health

Population and Human Health and Land, Soils and Geology

The use of plant machinery on site during excavation works and the movement of peat and spoil may result in the potential for soil and ground contamination. A wind farm and associated grid infrastructure is not a recognised source of pollution and so the potential for effects during the operational phase are imperceptible. With the implementation of mitigation and monitoring measures detailed in Section 8.5.2 and Section 8.5.3 of Chapter 8 (Lands, Soils and Geology) and the CEMP (Appendix 4-4), the potential for residual effects associated with soil or ground contamination during the construction and operational phases and subsequent health effects are long-term, imperceptible and negative.

On this basis, the identified interaction is Not Significant.

Population and Human Health and Water

Potential health effects arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies, see Section 5.8.3.2.2 of Chapter 5 (Population and Human Health).

There are no underground water or sewerage networks at Proposed Wind Farm infrastructure locations. Regionally, the Proposed Project site is located in a total of 3 no. surface water catchments. The vast majority of the Proposed Project site is located in the Lower Shannon surface water catchment within Hydrometric Area 25A of the Shannon Irish River Basin District (Shannon IRBD). Meanwhile, a small area in the northwest of the Proposed Project site is located within the Lower Shannon surface water catchment within Hydrometric Area 25B of the Shannon IRBD. Furthermore, a small section towards the north of the Proposed Project site is located in the Upper Shannon surface water catchment within Hydrometric Area 26G of the Shannon IRBD (www.epa.ie). Therefore, all surface waters draining the Proposed Project site will eventually discharge to the River Shannon. In terms of Groundwater Bodies (GWBs), the Proposed Project site is underlain by a total of 4 no. GWBs. The vast majority of the Proposed Project site is underlain by the Clara GWB (IE_SH_G_240). A small area in the north of the Proposed Project site is underlain by the Inny GWB (IE_SH_G_110) whilst some of the south of the Proposed Project site is underlain by the Ferbane GWB (IE_SH_G_089). The Boor Gravels GWB (IE_SH_G_258) is also mapped to underlie some elements of the Proposed Grid Connection in the north of the Proposed Project site.

The EPA mapping shows the Ballynahown Stream crossing agricultural land, in close proximity to the Proposed Grid Connection infrastructure located under the existing OHL. However, site walkover surveys have revealed that the EPA mapping is incorrect in this area. No watercourse extends across the field, with the only feature with a similar orientation to the EPA mapped stream being a surface water drain which terminates halfway across the field. Further details on this are provided in Section 9.3.9 of Chapter 9 (Water).

A search of private well locations (accuracy of 1 – 50m only) was undertaken using the GSI well database (www.gsi.ie). No such wells were identified either within or adjacent to the Proposed Project site. There is 1 no. well mapped approximately 0.9km west of the Proposed Project site.

The Proposed Project design and mitigation measures detailed in Chapter 9 (Water) and the CEMP (Appendix 4-4) ensures that the potential for effects on the water environment are not significant. A comprehensive suite of surface water mitigation measures and controls are outlined in Section 9.5 of Chapter 9 (Water) to ensure protection of all downstream receiving waters. Mitigation measures will ensure that surface runoff from the developed areas of the site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies, group water schemes, or wells and thus there will be no effects on human health.

On this basis, the identified interaction is Not Significant.

Population and Human Health and Air Quality

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 which will result in a short-term, slight, negative effect on local air quality. Mitigation measures to reduce dust and exhaust emissions generated during the construction phase of the Proposed Project are presented in Section 10.3 of Chapter 10 (Air Quality).

During the operational phase, the Proposed Project will generate additional traffic to the area in the form of 1 no. light goods vehicles (LGVs) visiting the site daily as there will be 1 no. staff member permanently on site for inspections and maintenance, giving rise to a short-term slight negative impact on air quality. However, wind turbines are not a recognised source of pollution and will instead be providing clean energy into the National Grid. This will have a long-term moderate positive effect on human health.

By 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 (CO₂), oxides of nitrogen (NO_x), and sulphur dioxide (SO₂). The production of renewable energy from the Proposed Project will have a long-term, moderate, positive impact on air quality.

On this basis, the identified interaction is Not Significant.

Population and Human Health and Climate

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 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 6MW per turbine for the Proposed Project would result in an estimated installed capacity of 90MW, displacing approximately 56,375 tonnes of carbon dioxide per annum or 1,973,125 tonnes over its operational life from traditional carbon-based electricity generation. There will be a long-term, moderate, positive effect on air quality and climate due to the offsetting that will occur.

On this basis, there identified interaction is Not Significant.

Population and Human Health and Noise and Vibration

As identified in Section 5.8 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 site which has the potential to cause a nuisance to sensitive receptors in the area. 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 (Noise and Vibration) and the CEMP (Appendix 4-4), will be implemented. The construction phase will likely give rise to a negative, imperceptible, long-term, residual effect on human health during the operational life of the Proposed Project due to the nuisance caused by construction plant and vehicle noise emissions.

As detailed in Section 12.7 of Chapter 12 (Noise and Vibration), the predicted noise emissions during the operational phase, once the appropriate mitigation measures are implemented, will be long-term negative and not significant. 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 DoEHLG 2006 Guidelines) 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.

On this basis, the identified interaction is Not Significant.

Population and Human Health and Landscape and Visual

The construction phase of the Proposed Project will see the temporary introduction of construction machinery and the erection of wind turbines into a natural but already heavily modified landscape. The erection of the proposed turbines in particular will change the existing landscape. 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.

Chapter 14 (Landscape and Visual) of this EIAR comprises the landscape and visual impact assessment of the Proposed Project. As detailed in Section 14.7 of Chapter 14 (Landscape and Visual), it is to be anticipated that wind farms inevitably cause ‘Significant’ visual effects on proximate sensitive visual receptors due to the prominence of turbines within landscape views and the ‘Substantial’ magnitude of change which will arise in close proximity to a wind farm development.

1 no. viewpoint, VP11 view from the R436 Regional Road, located 998 metres southeast of T5 was found to have Significant residual visual effects. This view is representative of residential receptors with open views towards the site in close proximity (within <1km from the site).

Of the other viewpoints assessed, visual effects from 8 no. viewpoints (i.e. VP01, VP03, VP09, VP12, VP13, VP16, VP17, VP18) are rated of moderate significance. The higher rating of significance at the above listed viewpoints is due to the close proximity to the proposed turbines where the magnitude of change is greatest, and the sensitivity is relatively high in respect of local residents who live in close proximity. There are 8 no. viewpoints assessed as resulting in ‘Slight’ residual effects (i.e. VP02, VP04, VP07, VP08, VP10, VP14, VP19, VP20), ‘Not Significant’ at 2 no. viewpoints (i.e. VP05, VP15), or Imperceptible at 1 no. viewpoint (i.e. VP06). Please see Section 14.5 of Chapter 14 (Landscape and Visual), Appendix 14-3 Photomontage Assessment Tables, and Volume 2: Photomontage Booklet for further detail on these viewpoints.

On this basis, the identified interaction is considered to be Significant for 1 no. location (i.e., VP11), and Not Significant at all other assessed locations.

Population and Human Health and Material Assets

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 and, therefore, is likely to create a temporary slight, negative impact on other road users, and will result in emissions of air pollutants, dust, and greenhouse gases. 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 operational phase, impacts on the surrounding local highway network will be long-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 imperceptible.

As detailed in Section 15.2.1 Chapter 15 (Material Assets), the Proposed Project will have a no impacts on telecommunications and aviation assets or operations and a short-term, slight, negative effect on utilities during the construction phase.

During the operational phase, there will be no impacts or associated effects on built services or telecommunications associated with the Proposed Project. The Proposed Project will have a long-term imperceptible neutral residual effect on aviation assets during the operational phase.

The Proposed Project has the potential to supply 90MW of electricity to the national grid during the operational phase, offsetting the use of fossil fuels within the electricity sector. This has a long-term moderate positive effect on national electricity supply and the offsetting of fossil fuel consumption, thereby resulting in a reduction in harmful emissions that can be damaging to human health.

On this basis, the identified interaction is Not Significant.

17.2.2 Biodiversity

Biodiversity and Birds

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) are included in Section 7.5 of Chapter 7 (Birds). Potential moderate impacts are only identified for wintering whooper swan and breeding lapwing due to habitat loss and disturbance effects during the construction phase and displacement during the operational phase.

A range of mitigation measures are in place to ensure that there will be no significant negative effects on any habitats or flora and fauna, these are contained within the Biodiversity Management and Enhancement Plan (BMEP), provided as Appendix 6-5. To ensure no impacts on habitats and disturbance for whooper swan and lapwing, there will be a 10ha seasonal lake for whooper swan and a 10ha grassland mosaic for lapwing within the Proposed Project site. These potential impacts have been assessed in Section 7.7 of Chapter 7 (Birds) of this EIAR. The 10ha seasonal lake and 10ha grassland mosaic will likely provide additional suitable habitat for lapwing and whooper swan as per findings of the BMEP.

As part of these measures outlined in the BMEP, there will be controlled flooding of an area of approximately 10ha, to a depth of approximately 1.5m via drain blocking and the creation of berms as required to contain water. The controlled flooding will be such that water will be present during the winter months when whooper swan is present. The 10ha grassland mosaic will be managed by annual mowing to keep the land open for breeding waders and free of avian predator posts (e.g. through birch scrub encroachment). Following the measures described in Sections 7.6 and 7.7 of Chapter 7 (Birds), no residual effect significance greater than low, as per Percival (2003) criteria, is identified for any KOR and no effect significance greater than slight, as per EPA (2022) criteria, is identified for any KOR. Significant residual effects on the KORs with regard to direct habitat loss, disturbance/displacement or collision mortality are not anticipated. Please see Chapter 7 (Birds) and Appendix 6-5 BEMP for details.

On this basis, the identified interaction is Not Significant.

Biodiversity and Land, Soils and Geology

No hedgerow or treeline removal is proposed as part of the Proposed Project. The Proposed Project has been designed to avoid, in so far as possible, the most sensitive habitats within the site. A range of mitigation measures are in place to ensure that there will be no significant negative effects on any habitats, species, protected sites or water quality and a BMEP has been prepared, provided as Appendix 6-5, providing for the enhancement of woodland habitat, establishment of marsh fritillary habitat, and linear hedgerow planting within the Proposed Project site. These potential impacts have been assessed in Section 6.4 of Chapter 6 (Biodiversity) of this EIAR. Excavated peat and spoil will be contained on site in the designated peat deposition areas or used for landscaping (Appendix 4-3: Peat and Spoil Management Plan).

As part of the construction phase, there will be approximate 209,846m³ of peat and 230,724m³ of spoil excavated for the Proposed Project that will require management within the site. It is proposed to manage any excess overburden generated through construction activities within the Proposed Project site, in 3 no. peat deposition areas. As part of the construction phase, the 4-no. proposed borrow pits will be infilled with excavated peat after all required material for construction has been excavated and will be reinstated and either reseeded or left to revegetate naturally. As identified in Section 8.5.2.2, there will be no loss of peat and spoil from the Proposed Project site, as it will be relocated and stored within the proposed onsite borrow pits, in the designated peat deposition areas and will be used in landscaping at the turbine locations or in linear berms (side cast) along access roads where appropriate. Excavated spoil material can also be reused as fill material. Table 8-11 in Chapter 8 (Land Soils and Geology) demonstrates that there is sufficient capacity to store all excavated peat and spoil at the Proposed Project site.

It is proposed to enhance and manage an area of approximately 7.8ha for native woodland replanting to ensure that there will be no net loss of woodland/scrub, and thus soils and subsoils, and that there will be a net gain in this habitat within the site. Approximately 6.5 km of native hedgerow within the Proposed Project site will be planted to enhance ecological connectivity across the site by linking existing features such as woodland edges and watercourse corridors and to support commuting routes for bats and other species. It is proposed to enhance approximately 6.7 ha of grassland (GS2) habitat to improve its suitability for marsh fritillary by increasing habitat heterogeneity and the abundance and accessibility of Devil's-bit scabious.

There will be no significant negative residual effect on these cutover bog and woodland habitats and thus on soils and subsoils. There may be a short-term negative effect in the early stages of implementation of the BMEP in the form of habitat loss where scrub encroachment is managed but as new habitats develop as a result of the proposed enhancement measures, there is potential for the Proposed Project to result in an overall long-term positive effect on habitats at a local scale. Please see Chapter 6 (Biodiversity) and Appendix 6-5 BEMP for details.

On this basis, the identified interaction is Not Significant.

Biodiversity and Water

Site 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. Operation of the Proposed Project will result in an overall increase in impermeable hard surfaces (e.g. turbine foundations, internal roads, hardstands), which has the potential to increase surface water runoff from the Proposed Project Site. This has potential to cause erosion of watercourses and impact on water quality. The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones (i.e. 50m to main watercourses, and 10m to main drains).

There is an extensive network of drains already existing at the Proposed Project site. The existing drainage infrastructure is operating in accordance with IPC licence requirements (P0500-01), with environmental monitoring and silt control measures being implemented. The existing drainage system at the Proposed Project site will be maintained and expanded locally as required for use within the Proposed Project 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.

These potential impacts have been assessed in Section 6.4 Chapter 6 (Biodiversity) and Section 9.5 Chapter 9 (Water) and the relevant mitigation measures outlined in these chapters and the CEMP (Appendix 4-4) will be in place to avoid any water pollution and subsequent effect on flora and fauna. The effect is considered to be negative, imperceptible, and temporary.

The elements of the BMEP which have the potential to impact on the water environment include the blocking of drains and the creation of the 10ha lake habitat and the 10ha grassland mosaic for lapwing. These measures will have a positive effect on the local hydrological regime, providing water attenuation and slowing the release of

water from the Proposed Project site as a result of drain blocking. Following the implementation of the BMEP, there is potential for a positive, moderate, and permanent effect on the local peat bog hydrology/hydrogeology.

On this basis, the identified interaction is Not Significant.

Biodiversity (including Birds) and Air Quality

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the site will have the potential to be a nuisance to flora and fauna (including birds), thereby having a short-term, slight, negative effect. The mitigation measures outlined in Section 10.3 Chapter 10 (Air Quality) of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

There is one ecological receptor/habitat within the Proposed Project site, which as described by the IAQM 2024 Guidance, may be sensitive to dust – i.e., cutover bog (PB4) - Medium Sensitivity. The overall risk of dust emissions impacts on sensitive ecological receptors with no mitigation applied for the major dust generating activities during the construction phase of the Proposed Project is **Low**. Therefore, the potential effects of dust from the construction phase of the Proposed Project are considered to be equivalent to a short-term, slight, negative effect. Please see Section 10.3.2.2 of Chapter 10 (Air Quality) for further detail.

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 moderate positive effect on air quality for biodiversity.

On this basis, the identified interaction is Not Significant.

Biodiversity (including Birds) and Climate

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 footprint will result in the loss of carbon fixing vegetation within the Proposed 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 effect on climate, and therefore on biodiversity (including birds), given the quantity of greenhouse gases that will be emitted to the atmosphere 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 and therefore biodiversity. The carbon storage capacity of restored habitats will vary over time as vegetation matures and land use and the baseline environment change. Therefore, while it can be assumed that measures outlined in the BMEP (Appendix 6-5) will result in an increased capacity of carbon storage due to the carbon storage potential that exists within these habitats, to ensure the carbon assessment contained in Section 11.4 of Chapter 11 (Climate) is completed under a theoretical precautionary scenario the quantification of these potential carbon savings (via an increase in carbon storage potential) associated with these measures has not been assessed. This is further outlined in identified in Chapter 11, Section 11.4.3.2.

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, 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, moderate positive effect on climate and therefore an indirect positive effect on biodiversity (including birds).

On this basis, the identified interaction is Not Significant.

Biodiversity and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for fauna, which use the Site. Best practice mitigation measures are included in Section 6.4 of Chapter 6 (Biodiversity) and Section 12.5 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.

Based on detailed information on the site layout, turbine noise emission levels and turbine hub height, 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 DoEHLG 2006 Guidelines.

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

On this basis, the identified interaction is Not Significant.

17.2.3 Birds

Birds and Land, Soils and Geology

As identified in Section 17.2.2 above, peat and subsoil will be excavated within the site and managed within the 2 no. peat deposition areas, 4 no. borrow bits, and via landscaping, therefore there will be no likelihood of disturbance of flora and fauna, including birds, in the areas surrounding the Proposed Project works area.

As part of the BMEP, there will be a 10ha seasonal lake for whooper swan and a 10ha grassland mosaic for lapwing within the Proposed Project site; this will have a direct effect on the land environment at the site, with the replacement of cutover peat with this manmade lake habitat. These potential impacts have been assessed in Section 7.7 of Chapter 7 (Birds) of this EIAR and Section 8.5.2 of Chapter 8 (Land Soils and Geology). As part of the implementation of the BMEP, there will be soil and drain reprofiling undertaken for mitigation measures to allow for the seasonal flooding of the 10ha lake for whooper swan and to allow unfledged lapwing chicks to move between dry and damp areas within the 10ha grassland mosaic. During the construction and operational phase, there will be a short-term to long-term, negative, slight, effect on peat and subsoils due to disturbance and relocation within the site.

As outlined in Section 7.5.2 of Chapter 7, there is the potential for a short-term moderate negative effect (EPA, 2022) on whooper swan due to habitat loss and disturbance effects during the construction phase, and long-term moderate negative effect (EPA, 2022) due to displacement during the operational phase, in relation to the identified regularly used roost sites within the Proposed Project Site. Measures have been designed to offset these potential impacts and are outlined in Section 7.7.1 of Chapter 7 (Birds).

On this basis, the identified interaction is Not Significant.

Birds and Water

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

of Chapter 9 (Water) and the CEMP (Appendix 4-4), there will be no significant residual effect on aquatic habitats or species as a result of the Proposed Project.

Drain reprofiling and infilling will occur to facilitate the proposed ornithological enhancement and mitigation measures contained in Section 7.7 (Birds) and Appendix 6-5 (BMEP). The 10ha seasonal lake for whooper swan is proposed near the western boundary of the Proposed Wind Farm, near Site Entrance 1 (see Table 4-9 of Chapter 4) in an area of bare cutover peat, significantly removed from turbine infrastructure. The 10ha grassland mosaic for lapwing is proposed adjacent to the seasonal lake and will be managed by regular mowing to keep the land open for breeding waders and free of predator posts (e.g. through birch scrub encroachment).

Section 9.5.2.12 of Chapter 9 (Water) identifies that following the implementation of the proposed biodiversity enhancement works, the proposed 10ha for Whooper Swan enhancement will be flooded and will retain significant volumes of water. Elsewhere, where drain blocking is proposed the site will likely be wetter, will retain more water and will recolonise with vegetation slowly. As such, it is determined that there will be a moderate, positive, permanent effect on local peat bog hydrology/hydrogeology and therefore on habitats and species (including birds).

On this basis, the identified interaction is Not Significant.

Birds and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for birds, which use the site. Best practice mitigation measures are included in Section 7.7 of Chapter 7 (Birds) and Section 12.6 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.

The limited onsite noise activity generated by the Proposed Project during the operational phase will have a long-term, not-significant, negative effect on flora and fauna (including birds).

On this basis, the identified interaction is Not Significant.

17.2.4 Land, Soils and Geology

Land, Soils and Geology and Water

As identified in Section 8.5 of Chapter 8 (Lands, Soils and Geology) of this EIAR, the erosion of soil/subsoil can have the effect of reducing the overall volume of soil/subsoil at the Proposed Project site, with the potential for some eroded subsoils to reach watercourses, leading to water quality issues such as high turbidity. This has the potential to have a slight short term negative effect on water quality. Mitigation measures to ensure there are not significant, negative effects on water quality are presented in Section 8.5.2 of Chapter 8 (Lands, Soils and Geology), Section 9.5 of Chapter 9 (Water) and the CEMP (Appendix 4-4).

The measures proposed as part of the BMEP will result in drain reprofiling and infilling, furthermore, as identified in Section 17.2.2 above, as part of the construction works of the site there will be approximately 209,846m³ of peat and 230,724m³ of spoil excavated for the Proposed Project that will require management within the site. Table 8-11 in Chapter 8 (Land Soils and Geology) demonstrates that there is sufficient capacity to store all excavated peat and spoil at the Proposed Project site.

During the construction and operational phase, there will be a short-term to long-term, negative, slight, effect on peat and subsoils due to disturbance and relocation within the site.

Section 9.5.2.12 of Chapter 9 (Water) identifies that following the implementation of the proposed biodiversity enhancement works, the proposed 10ha for Whooper Swan enhancement will be flooded and will retain significant volumes of water. Elsewhere, where drain blocking is proposed the site will likely be wetter, will

retain more water and will recolonise with vegetation slowly. As such, it is determined that there will be a moderate, positive, permanent effect on local peat bog hydrology/hydrogeology.

On this basis, the identified interaction is Not Significant.

Land, Soils and Geology and Air Quality

The excavation works and transportation of vehicles to/from and around the Proposed Project site will give rise to dust, which is considered a short-term, slight, negative impact on air quality. Mitigation measures outlined in Section 10.3 of Chapter 10 (Air Quality) will reduce the potential for negative effects on land, soils, and geology, including includes dust suppression measures which is further outlined in the CEMP (Appendix 4-4).

On this basis, the identified interaction is Not Significant.

Land, Soils and Geology and Climate

The construction of the Proposed Project will require construction materials (such as cement), and the operation of construction vehicles and plant on and off-site, and the transport of workers to and from the site. Some potential long-term slight negative effects will occur due to the removal of carbon fixing soil, peat, vegetation and habitat, however, that has been avoided where possible by the design and layout of the Proposed Project. This impact will be negative and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. As discussed above in Section 17.2.1, 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.

On this basis, the identified interaction is Not Significant.

Land, Soils and Geology and Cultural Heritage

The majority of recorded monuments within the Proposed Project site 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 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 infrastructure, i.e., proposed new roads) interacts with recorded monument (gravel/stone trackway OF007-350—, i.e., a ‘toghher’) at 2 no. locations. The implementation of a horizontal buffer (0.5m) and the use of a floating road to ensure the preservation in situ of the togher will ensure there are no direct effects to this monument. In this regard the residual effect is considered to be permanent, negative and imperceptible. The construction phase will not have any significant effects on recorded monuments since they will be dealt with by way of mitigation measures.

During the operational phase, there is no potential for impacts on cultural heritage from a Land, Soils and Geology perspective as there will be no groundworks or excavations associated with this phase.

Land, Soils and Geology and Landscape and Visual

The removal of spoil and the subsequent replacement with crushed stone for the construction of the site roads and hardstanding areas within the Proposed Project site has the potential to alter the local landscape. The visual effect of this change is expected to be short-term, negative and slight.

On this basis, the identified interaction is Not Significant.

17.2.5 Water

Water and Climate

Chapter 9 (Water) and the accompanying Flood Risk Assessment (FRA) (Appendix 9-1) detail the flood risk of the Proposed Project. The FRA identifies that it is likely that climate change will have significant impacts on flooding and flood risk in Ireland due to rising sea levels, increased winter rainfall and more intense rainfall.

The OPW's National Indicative Flood Maps (NIFM) shows that some of the Proposed Project site is located in Fluvial Flood Zone A, (Figure G of Appendix 9-1), associated with flooding along the Lemanaghan Stream. However, the vast majority of the Proposed Project site is mapped outside of the 1 in 100-year and 1 in 1,000-year flood zones and is deemed to be at low risk of fluvial flooding (Fluvial Flood Zone C). T12 and associated proposed new roads are mapped in the low probability fluvial flood zone along the Lemanaghan Stream, associated with the 1 in 1,000-year flood event (Flood Zone B).

The Catchment Flood Risk Assessment and Management (CFRAM) Programme has modelled flooding associated with 2 no. potential future climate change scenarios. The Mid-Range and High-End Future Scenario flood extents were generated using an increase in rainfall of 20% and 30% respectively. The extent of the CFRAM flood zones along the Brosna River increase slightly for each future scenario. However, the low probability flood zone associated with the High-End Future Scenario (Figure H of Appendix 9-1) does not encroach upon the Proposed Project site. Similarly, NIFM mapping has been modelled for the 2-no. potential future climate change scenarios.

Both of these modelled flood extents show similar flood zones to the Present-Day Scenario and are discussed further in Section 4.3.6 in Appendix 9-1. Therefore, flood zones at the Proposed Project site are unlikely to be significantly impacted by future climate change.

The FRA concludes that the overall risk of flooding posed at the site is low. Furthermore, the risk of the Proposed Project contributing to flooding is also very low, as the long-term plan for the site is to retain and slow down drainage from the bogs, and this will result in sections of the site being wetter for longer and therefore promoting more Fen-like conditions.

It is expected that without mitigation measures there would be negative, slight, direct, permanent, unlikely effect on all downstream surface water bodies due to flooding. However, due to the mitigation measures set out in Chapter 9, Section 9.5.3, no significant effects on downstream flood risk will occur.

On this basis, the identified interaction is Not Significant.

17.2.6 Air Quality

Air Quality and Material Assets

The transportation of vehicles to/from and around the Proposed Project site will give rise to dust and exhaust emissions which is considered a short-term, slight, negative impact on air quality. Following implementation of mitigation measures as outlined in Section 10.3 of Chapter 10 (Air Quality), Section 15.2 of Chapter 15 (Material Assets) and the CEMP (Appendix 4-4) there will be a short-term, imperceptible, negative effect on air quality due to transportation movements. Dust and exhaust emissions generated through the transportation of vehicles to/from and around the Proposed Project site during the operational phase (1-2 LGVs per day) are imperceptible.

On this basis, the identified interaction is Not Significant.

17.2.7 Climate

Climate and Material Assets

The construction of the Proposed Project will result in greenhouse gas emissions associated with the production of Proposed Project infrastructure and construction materials, and operation of vehicles and plant. As well, the Proposed Project footprint will result in the loss of carbon fixing vegetation within the Proposed Project site. This negative impact will be permanent negative and imperceptible, given the quantity of greenhouse gases that will be emitted to the atmosphere 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 and therefore Material Assets. This is assessed further in Section 11.5 of Chapter 11 (Climate) of this EIAR, and mitigation measures are presented to minimise any potential effects.

During the operational phase, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Project, this will be offset by the operation of the Proposed Project which will offset 56,375 tonnes of carbon dioxide per annum or 1,973,125 tonnes over its operational life from traditional carbon-based electricity generation. Subsequently, this will cause a long-term moderate positive effect on Climate as a result of reduced greenhouse gas emissions.

On this basis, the identified interaction is Not Significant.

17.2.8 Landscape and Visual

Landscape and Visual and Cultural Heritage

As described in Section 14.5 of Chapter 14 (Landscape and Visual) of this EIAR, the Proposed Project has the potential to change the landscape setting of recorded sites and monuments in the wider area. Chapter 13 (Cultural Heritage) identified that the 491 monuments located within the Proposed Project site with 577 monuments located outside the Proposed Project site within 5km of the nearest proposed turbine.

The assessment of effects on visual setting was undertaken using both the Zone of Theoretical Visibility (ZTV) map in the Landscape and Visual Impact Assessment (LVIA), as presented in Chapter 14 of this EIAR.

Furthermore, as detailed in Section 3.2.5 of Chapter 3 (Site Selection and Reasonable Alternatives), a detailed landscape and visual assessment of the turbine layout with a 200m tip height versus a 220m tip height was conducted to determine the potential effects of the Proposed Wind Farm on residential and visual amenity as well as cultural heritage, it was determined that the required setbacks between turbines with a tip height of 220m afforded more screening from nearby receptors (both residential and cultural heritage, primarily Saint Manchan's Well) and decreases the horizontal extent of the view of the proposed turbines in close proximity.

No UNESCO World Heritage Sites (WHS) or those on the Tentative list are located within the Proposed Project site or in close proximity to same. Theoretical visibility of 11-15 proposed turbines is demonstrated from the Hill of Uisneach and while the introduction of the Proposed Project will result in a change to the wider setting in which the Hill of Uisneach is located, given the intervening distance, topography and vegetation this is considered to have a long-term, imperceptible, negative effect.

No National Monuments or those subject to a Preservation Order are located within or adjacent to the Proposed Project site. It is therefore considered that the potential visual effects to National Monuments and those subject to a Preservation Order identified are long-term, imperceptible, negative as the distance of the National Monuments and those subject to Preservation Orders from the Proposed Project will mitigate potential visual effects.

A total of one thousand and sixty-eight (1068) recorded monuments are located within 5km of the nearest proposed turbine. This number includes the 491 monuments located within the Proposed Project site with 577 monuments located outside the Proposed Project site within 5km of the nearest proposed turbine. The ZTV shows that the majority of monuments located within 5km of the nearest proposed turbine are located in areas where 11-15 turbines will theoretically be visible.

It is noted that for all the above impacts, the reality of the effect will be reduced as the ZTV model does not take natural screening and buildings into consideration which will alleviate if not remove the effect on setting altogether. Furthermore, many of these monuments are not readily discernible in the landscape which further ameliorates effects on setting. The residual effects range from imperceptible to moderate and are considered to be long-term and negative on cultural heritage.

Appendix 13-5: Lemanaghan Monastic Complex: Historic, Landscape and Visual Context includes a detailed historic landscape and visual context pertaining to the Lemanaghan Monastic Complex. The Lemanaghan Monastic Site is approximately 1.2km southeast of the nearest proposed turbine (i.e., T05) and is separated by multiple agricultural fields, farms, residences and is enclosed by mature vegetation and boundary walls. The Proposed Project will not directly impact the physical fabric of the landscape of the Lemanaghan Monastic Complex; residual effects on the landscape setting of the Lemanaghan Monastic Complex are deemed to be long-term, moderate and negative.

Overall effects on recorded monuments from a visual perspective are deemed to be long-term, although would be removed following the decommissioning and removal of the turbines.

On this basis, the identified interaction is Not Significant.

17.2.9 Vulnerability to Natural Disasters

As described in Chapter 16 (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.

17.3 Mitigation and Residual Effects

Where any potential interactive 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 – 16) of the EIAR 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.

On this basis the effects arising from the identified interactions are Not Significant, with the exception of 1 no. location (VP11) resulting in a Significant interaction between Population and Human Health and Landscape and Visual.