

## 16. INTERACTION OF EFFECTS

### 16.1 Introduction

The preceding Chapters 5 to 14 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Flora and Fauna), Ornithology (Birds), Land, Soils and Geology, Water (Hydrology and Hydrogeology), Air and Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage) and Material Assets (Roads and Traffic, Telecommunications, Aviation, Utilities and Waste Management), as a result of the Proposed Development as described in Chapter 4 of this EIAR. All of the potential significant effects of the Proposed Development and the measures proposed to mitigate them have been outlined in the preceding chapters of this EIAR. Mitigation measures and best practise measures for the construction, operation and decommissioning of the Proposed Development are detailed in the accompanying Construction Environment Management Plan (CEMP). 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 16.1 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 effects but of a lesser magnitude. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

Table 16-1 Interaction Matrix: Potential for Interacting Impacts

	Phase	Population and Human Health	Biodiversity	Ornithology	Land, Soils and Geology	Hydrology & Hydrogeology	Air & Climate	Noise & Vibration	Landscape & Visual	Heritage	Material Assets
Population and Human Health	C	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
	O	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Biodiversity	C	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
	O	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Ornithology	C	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
	O	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Land, Soils and Geology	C	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
	O	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Water	C	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
	O	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Air and Climate	C	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue	Light Blue
Noise and Vibration	C	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue	Light Blue
Landscape and Visual	C	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue	Light Blue
Cultural Heritage	C	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black	Light Blue
Material Assets	C	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black
	O	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Black

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

The potential for interaction of effects has been assessed as part of the Impact Assessment process. While the work on all parts of the Environmental Impact Assessment Report (EIAR) were not carried out by MKO, the entire project and all the work of all sub-consultants was managed and coordinated by the company. This 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 above and summarised in Section 16.2 below.

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

### 16.1.1 Statement of Authority

This section of the EIAR has been prepared by Karen Mulryan and reviewed by Michael Watson, of MKO. Karen is a Project Environmental Scientist with MKO with over 6 years' experience in the consultancy sector. Karen holds a BA International in Archaeology from NUI Galway and a MSc in Archaeology from the University of Edinburgh. Karen's key strengths and areas of expertise are in project management, environmental impact assessment, wind energy site selection and feasibility assessment. Since joining MKO, Karen has experience managing wind farm Environmental Impact Assessment Report applications of various scales including SID applications across Ireland. Karen has experience in report writing, including EIAR Population and Health chapters, feasibility studies and EIA screening reports. Karen holds memberships with the Chartered Institute for Archaeologists (ACIfA) and the Institute of Archaeologists of Ireland (IAI).

Michael Watson is Project Director and head of the Environment Team in MKO. Michael has over 20 years' experience in the environmental sector. Michael's professional experience includes managing and overseeing Environmental Impact Assessment Reports including Population and Human Health reports, EPA License applications, hydrogeological assessments, environmental due diligence and general environmental assessment on behalf of clients in the wind farm, waste management, public sector, commercial and industrial sectors nationally. Michael also has a Bachelor of Arts Degree in Geography and Economics from NUI Maynooth, is a Member of IEMA, a Chartered Environmentalist (CEnv) and Professional Geologist (PGeo).

## 16.2 Impact Interactions

### 16.2.1 Population and Human Health

#### Population and Human Health, and Noise

As identified in Chapter 5 of this EIAR, the construction phase will generate an increase in noise levels in the vicinity of the Wind Farm Site, as a result of heavy machinery and construction work which has the potential to cause a nuisance to sensitive receptors located closest the site boundary. 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 11 Noise and Vibration and the CEMP will be implemented. The construction phase will likely create a short-term, slight negative effect on human health due to the nuisance caused by construction plant and vehicle noise emissions. During the operational phase the Proposed Development is likely to generate noise but will be within the relevant best practice noise criteria curves for wind farms at all locations.

#### Population and Human Health, Land, Soils and Geology

The excavation and movement of peat and spoil during the construction phase of the Proposed Development has is likely to create dust emissions which will result in a short term imperceptible negative

effect on local air quality and human health. Mitigation measures to reduce dust emissions generated during the construction phase of the Proposed Development are presented in Chapter 10.

### Population and Human Health, Air and Climate

The excavation and movement of peat and spoil during the construction phase of the Proposed Development has is likely to create dust and CO<sub>2</sub> emissions which will result in a temporary, slight, negative effect on local air quality and human health. Mitigation measures to reduce dust and CO<sub>2</sub> emissions generated during the construction phase of the Proposed Development are presented in Chapter 10.

During the operational phase, the sources of dust and other emissions generated will be from infrequent visits by maintenance staff in light good vehicles (LGVs) (estimated at 1-2 times per week), and private cars from locals (estimated at 40 movements per day or 20 cars) who may use the amenity car parks that will be provided to the public so they can enjoy the wind farm paths for walking, running etc. It is also expected that locals will cycle and walk to the site to avail of the amenity trails. Cycle racks will be provided at the carparks for those who cycle to the site and chose to walk the trails.

It is estimated that the proposed Ballivor Wind Farm, with a potential installed capacity in the range of 117MW to 169MW, will offer significant benefits in terms of renewable energy production and reductions in greenhouse gas emissions by its net displacement of approximately 6,035,010 tonnes and 8,717,237 tonnes of Carbon Dioxide (CO<sub>2</sub>) per annum (Against EU FFC). This will be a long-term significant positive impact on CO<sub>2</sub> emissions and energy targets with the implementation of the Proposed Development.

### Population and Human Health and Hydrology & Hydrogeology

As described in Chapter 9 of this EIAR, the construction phase of the Proposed Development could give rise to water pollution. Chapter 9 Hydrology and Hydrogeology assess the potential for impact on public water supply and private wells during the construction and decommissioning phases. The assessment concludes that there will be no significant direct or indirect effects on water quality with the implementation of the drainage design measures and mitigation as detailed in Chapter 9 and the CEMP.

During the operational phase, 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 roads, hardstand areas and amenity pathways. These works would be of a very minor scale and would be very infrequent. Mitigation measures as detailed in Chapter 9 and the CEMP will be implemented for the operational phase and as such impacts are considered to be long term imperceptible negative on downstream water quality.

### Population and Human Health, and Material Assets

Chapter 14 of this EIAR discusses how the construction phase of the 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 some short-term inconvenience for other road users. A Traffic Management Plan will be in place to minimise all disruption, as described in the Construction and Environmental Management Plan (see Appendix 4-3). During the operational phase, maintenance traffic in the form of Light Goods Vehicles (LGVs) will visit the site 1-2 times per week and private cars from locals (estimated at 40 movements per day or 20 cars) who may use the amenity car parks that will be provided. The provision of permanent carparks inside the Ballivor and Carranstown entrances and in the northeast of Bracklin are proposed to facilitate visitors availing of the proposed Ballivor Wind Farm amenity trails for walking and cycling. Cycle racks will be provided at each carpark for those who cycle to the site and chose to walk the trails. Both the maintenance and amenity vehicles in the area will have a long term imperceptible negative effect local roads and local road users.

### Population and Human Health, and Landscape and Visual

The construction phase of the Proposed Development will see the temporary introduction of construction machinery and the erection of wind turbines into a natural, but already modified landscape. The erection of the 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 13 of this EIAR comprises the landscape and visual impact assessment of the Proposed Development. As part of this assessment, photomontages were used to assess the visual effects arising as a result of the Proposed Development from 19 No. viewpoint locations. The assessment concludes that no 'Profound' or 'Very Significant' effects occurred at any of the 19 viewpoints. Residual effects of 'Significant' occurred at one viewpoint location (VP03) as the turbines are in close proximity <1km. However, the Proposed Development adheres to the recommended 500m set back distance in the Guidelines (DoEHLG, 2006) and also the 4 times tip height set-back distance set out for residential visual amenity prescribed by the draft Guidelines (DOHPLG, 2019). No significant effects occurred from any other residencies or settlements within 5km of the site.

## 16.2.2 Biodiversity

### Biodiversity and Land, Soils and Geology

The removal of overburden and peat is likely to result in some disturbance of flora and fauna in non-designated areas surrounding the proposed works area thereby, potentially causing negative impacts on flora and fauna. Please see Chapter 6 for details. Excavated peat and spoil will be permanently placed along access roads and used for landscaping. No interactions are anticipated during the operational phase.

### Biodiversity and Hydrology and hydrogeology

Site activities during the construction phase 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 site activities during the construction phase, and continuing on for the operational phase, will give rise to additional localised drainage, which has potential to have a negative impacts on flora, aquatic life and their associated habitats should the appropriate measures not be implemented. These potential impacts have been assessed in Chapter 6 and Chapter 9 of this EIAR, and the relevant measures will be in place to avoid any water pollution and subsequent effect on flora and fauna.

### Biodiversity and Air and Climate

During the construction phase, the temporary of release of CO<sub>2</sub> primarily due to peat excavation but also from other sources such as construction vehicles and plant machinery is anticipated. This may have a negative impact on biodiversity. During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, contributing to a slower increase in the rate of global warming and a reduction in air pollution. In combination with other renewable energy projects, this will have a long term positive effect on flora and fauna.

### Biodiversity and Noise and Vibration

Site activity during the construction phase is likely to give rise to noise that could be a nuisance for fauna resulting in a temporary, slight, negative effect.

## Biodiversity and Landscape

The removal of some vegetation within the development footprint and surrounding areas is likely to result in a change to the visual landscape during the construction phase, which will become part of the normal landscape of the wider area for the duration of the operational phase. The visual effect of this change is considered to be long-term, localised and slight.

### 16.2.3 Ornithology

#### Ornithology and Hydrology and Hydrogeology

Site activities during the construction phase have the potential to give rise to water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use that water within the same catchment. The site activities during the construction phase, and continuing on for the operational phase, are likely to give rise to additional localised drainage, which may have the potential negatively impact habitats of particular bird species. Please see chapter 7 Ornithology and Chapter 9 Hydrology and Hydrogeology of this EIAR.

#### Ornithology and Land, Soils and Geology

The removal of peat and spoil and some vegetation during construction of the Proposed Development, is likely to result in some displacement of flora and fauna, including birds, potentially causing negative impacts on birds. Please see Chapter 7 for details. Excavated peat and spoil will be permanently placed along access roads and used for landscaping. No interactions are anticipated during the operational phase.

#### Ornithology and Air and Climate

During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and, consequently, could in combination with other renewable energy projects, contribute to preventing the loss of bird species from Ireland as a result of climate change.

#### Ornithology and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for birds that use the site, therefore, potentially causing, a negative impact on ornithology. Best practice mitigation measures are included in Chapter 9 and Chapter 11 to minimise the potential negative effect of noise generated during the construction phase on ornithology.

### 16.2.4 Land, Soils and Geology

#### Land, Soils and Geology and Water

As identified in Chapter 9 of this EIAR, the movement and removal of peat and spoil during the construction phase is likely to have a significant, negative effect on water quality. Mitigation measures to ensure there are no significant, negative effects on water quality are presented in Chapter 9.

#### Land, Soils and Geology and Archaeological, Architectural and Cultural Heritage

The removal of peat and spoil during the construction phase is likely to have a permanent, significant, negative effect on previously unrecorded sub-surface archaeological site and artefacts. Mitigation measures outlined in Chapter 13 will reduce the potential for negative effects on unrecorded sites and artefacts during excavations.

#### Land, Soils and Geology and Landscape and Visual

The removal of peat and spoil and the subsequent replacement with crushed stone for the construction of some site roads (the majority of roads will be floated), substation and hardstanding areas within the Proposed Development site is likely to alter the local landscape. The visual effect of this change will be long term, localised in nature and slight.

### 16.2.5 Air and Climate

#### Air and Climate and Material Assets

The movement of construction vehicles both within and to and from the site is likely to give rise to dust nuisance effects during the construction phase. This is assessed further in Chapter 10 of this EIAR, and mitigation measures are presented to minimise any potential effects.

### 16.2.6 Landscape and Visual

#### Landscape and Visual and Cultural Heritage

As described in Chapter 13 of this EIAR, the Proposed Development is likely to change the landscape setting of recorded sites and monuments in the wider area and, therefore, potentially having an indirect, long term, slight to moderate, negative effect on archaeological, and cultural heritage.

### 16.3 Mitigation and Residual Impacts

Where any potential interactive negative impacts have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5-14) of the EIAR and are detailed in the CEMP. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual impacts and the significance of effects, is also presented in each relevant chapter.