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# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BARNADIVANE WIND FARM & SUBSTATION, CO. CORK

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## VOLUME 2 – MAIN EIAR CHAPTER 15 – INTERACTIONS OF THE FOREGOING

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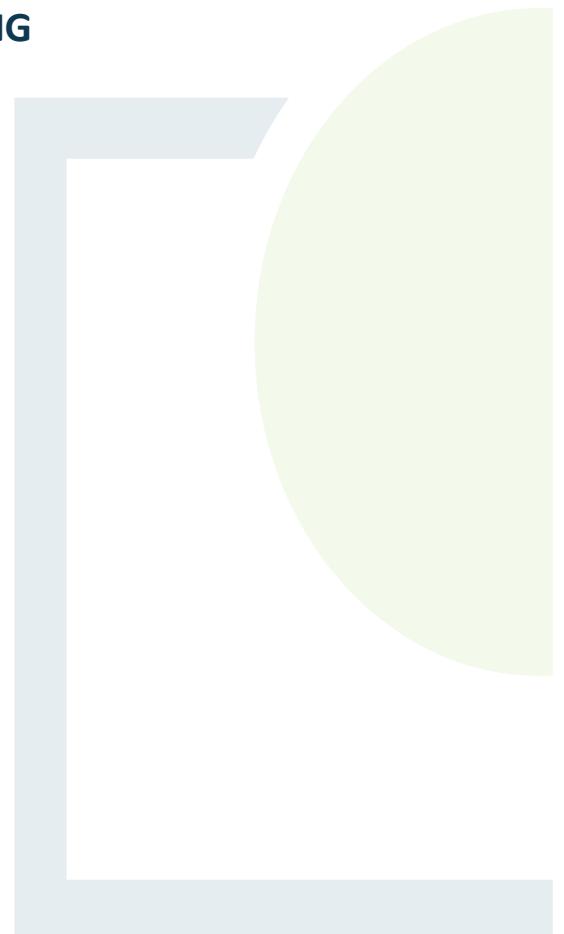
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## 15 INTERACTIONS OF THE FOREGOING

### 15.1 Introduction

The requirement for the identification of interactions between the various aspects of the environment as detailed throughout the EIAR is set out in Article 3(1) of the amended EIA Directive 2011/92/EU as amended by the Directive 2014/52/EU, which states the following:

*“The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*

- a) population and human health;
- b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- c) land, soil, water, air and climate;
- d) material assets, cultural heritage and the landscape;
- e) the interaction between the factors referred to in points (a) to (d).”

In the preparation of this chapter, regard was had to the Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact interactions (European Commission, 1999), the EPA’s Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022), and the European Commission’s Guidance on the Preparation of the Environmental Impact Assessment Report (2017).

This Chapter considers the potential for interactions and inter-relationships between one aspect of the environment and another which can result in an impact being either positive or negative, as well as having varying significance. The chapter considers potential significant environmental effects that may occur in terms of the interaction and inter-relationships of Air Quality & Climate, Noise & Vibration, Biodiversity, Soils, Geology and Hydrogeology, Hydrology & Water Quality, Population & Human Health, Material Assets (Including Shadow Flicker), Traffic & Transportation, Archaeology, Architectural & Cultural heritage, Landscape & Visual and Telecommunications & Aviation, as a result of the Proposed Project as described in Chapter 2 of this EIAR.

Direct, indirect, cumulative and interactive impacts were considered during the siting of the proposed turbines and associated infrastructure in order to minimise impacts on the environmental aspects mentioned above. The interactions and inter-relationships of the potential impacts as set out throughout this EIAR are detailed in this Chapter. Table 17-1 herein provides a matrix detailing the key interactions and inter-relationships between the key environmental aspects of the Proposed Project, including the Proposed Wind Farm, the Proposed Substation, Enabling TDR Works and, alternative grid connection route (AGCR) and the turbine delivery route (TDR).

Table 17-2 provides further details and examples of the diverse range of interaction and inter-relationships between the key environmental aspects.

Each individual chapter of the EIAR has had regard to interactions between different potential impacts. For example, Hydrology & Water Quality has had regard to potential impacts on Biodiversity; and Soils, Geology and Hydrogeology has had regard to potential impacts on both Biodiversity, Hydrology & Water Quality and Traffic & Transportation.



The Proposed Project in this EIA is comprised of the following key elements:

1. Proposed 6 no. turbine windfarm also referred to in this report as ‘the Proposed Wind Farm’ (pending under An Bord Pleanála planning ref. PL04.308208);
2. Proposed 110kV substation within the site of the Proposed Wind Farm, also referred to as ‘the Proposed Substation’ (pending under An Bord Pleanála planning ref. PL04.308210);

The in-combination effects of the following elements of the Proposed Project are include in the assessment.

1. Enabling works for the Turbine Delivery Route, also referred to in this report as ‘Enabling TDR Works’ (permitted under Cork County Council planning ref. 14/6803);
2. Potential alternative grid connection, also referred to in this report as the ‘the AGCR’ (permitted under Cork County Council planning ref. 15/730 & An Bord Pleanála Ref. PL04.246353).



**Table 17-1: Matrix of Interaction Between key Environmental Aspects**

	Air Quality & Climate	Noise & Vibration	Biodiversity	Soils, Geology and Hydrogeology	Hydrology & Water Quality	Population, Human Health & Material Assets	Traffic & Transport	Archaeological, Architectural & Cultural Heritage	Landscape & Visual	Telecommunications & Aviation
Air & Climate										
Noise & Vibration										
Biodiversity										
Soils, Geology and Hydrogeology										
Hydrology & Water Quality										
Population, Human Health & Material Assets (including Shadow Flicker)										
Traffic & Transport										
Archaeological, Architectural & Cultural Heritage										
Landscape & Visual Impact										
Telecommunications & Aviation										

 = interaction or inter-relationship  
 = no interaction or inter-relationship



**Table 17-2: Description of Interactions Between Key Environmental Aspects**

INTERACTION	DESCRIPTION
Soils, Geology & Hydrogeology, Air Quality & Climate Population & Human Health	<p>During the construction phase of the Proposed Project there is potential for impact to human health as a result of construction activities by migration of dust. Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source. Dust emissions can lead to elevated PM10 and PM2.5 concentrations impacting on air quality and potentially impacting on human health at nearby dwellings. There are two human receptors; both of which are residential, occupied dwellings; within 100m of the red-line boundary of the Wind Farm site (House number 20 at ITM 535473, 564075 and House number 30 at 535012, 563959). Due to the small number of receptors, and distance from the source of the dust emissions, the “sensitivity” of the area is considered to be “low”. The construction of the Proposed Substation is considered a medium construction site. There is one receptor within 50m of the red-line boundary of the site (House number 30 at 535012, 563959). The Risk of Dust Impacts during the construction phase of the substation are “Low Risk”. However, this receptor may experience the soiling, deposition or vegetation effects as construction traffic passes in close proximity to the dwelling.</p> <p>Mitigation measures have been set out in Chapter 14: Air Quality &amp; Climate, Chapter 6: Soils, Geology and Hydrogeology, Chapter 10: Population and Human Health &amp; Material Assets to avoid the impact of dust on nearby residential properties. Mitigation measures include the use of a specific haul route, diversions and speed limits to limit the spread of dust and the implementation of a dust control plan where construction works will be in proximity to residential properties.</p>
Soils, Geology & Hydrogeology, Air Quality & Climate Biodiversity Traffic & Transport	<p>During the construction and decommissioning phase of the Proposed Project, there is potential for impact to biodiversity due to vegetation effects (soiling of vegetation from dust) as a result of construction activity. This can impact on air quality, plant species and habitat. Mitigation has been set out in Chapter 14: Air Quality &amp; Climate, Chapter 5: Biodiversity, Chapter 6: Soils, Geology and Hydrogeology and Chapter 11: Traffic &amp; Transportation in order to reduce potential soiling and vegetation affects including the covering of loads which may be sources of dust migration.</p>
Noise & Vibration Soils, Geology & Hydrogeology, Air Quality & Climate Traffic & Transportation Population & Human Health	<p>During the construction phase of the Proposed Project, the construction works, in combination with the projected increase in traffic, has the potential to impact on human health and residential amenity by causing noise and dust nuisance at nearby dwellings. Mitigation measures include the use of temporary barriers or screens to reduce noise impact and the use of a dust control plan to mitigate against the dispersal of dust. Mitigation is set out in Chapter 14: Air Quality &amp; Climate, Chapter 9: Noise &amp; Vibration, Chapter 6: Soils, Geology and Hydrogeology and Chapter 11: Traffic &amp; Transportation to reduce the potential impact these construction activities may have on residential amenity and human health.</p>



INTERACTION	DESCRIPTION
Hydrology & Water Quality Soils, Geology & Hydrogeology, Biodiversity	The construction phase of the Proposed Project has potential to impact on water quality, aquatic biodiversity and habitats as a result of excavation and vegetation clearance. This can result in the deterioration of water quality due to sediment and nutrient release to watercourses and has potential to impact on European sites hydrologically connected to the project. Furthermore, the potential for spillage of hydrocarbons from refueling or from malfunctioning machinery also has potential to impact on water quality and aquatic biodiversity. Mitigation measures have been set out in Chapter 5: Biodiversity, Chapter 6: Soils, Geology and Hydrogeology and Chapter 7: Hydrology & Water Quality in order to reduce potential impacts on watercourses and biodiversity.
Soils, Geology & Hydrogeology, Hydrology & Water Quality Population & Human Health	Construction activities associated with the Proposed Project have potential to result in the erosion of exposed soil which can lead to sediment and nutrient concentrations in surface water run-off. This has potential to impact groundwater quality in the underlying Locally Important Aquifer. Similarly, the potential for spillage of hydrocarbons used on site has potential to impact on ground water quality. This has potential to impact on drinking water of nearby wells which can impact on human health. Mitigation measures are set out in Chapter 6: Soils, Geology and Hydrogeology and Chapter 7: Hydrology & Water Quality to avoid potential impacts on ground water.
Soils, Geology & Hydrogeology, Hydrology & Water Quality Traffic & Transportation Population & Human Health	The activities associated with the construction and decommissioning of the Proposed Project have potential to result in soil compaction due to use of heavy machinery and construction traffic at the Site. Soil compaction can reduce the infiltration of runoff and may result in areas of standing water which pose potential health and safety issues to construction workers and the general public. Mitigation measures have been set out in Chapter 6: Soils, Geology and Hydrogeology, Chapter 7: Hydrology & Water Quality, Chapter 11: Population, Human Health & Material Assets and Chapter 11: Traffic & Transportation.
Hydrology & Water Quality Biodiversity	During the construction and decommissioning phases of the Proposed Project, sanitary waste and material waste accumulated at the Site has potential to impact on water quality and biodiversity if mishandled or disposed of inappropriately. As set out in the Construction Environmental Management Plan (CEMP) included in Appendix 2.2, all on-site waste will be stored appropriately and disposed of at a licensed waste facility.
Population & Human Health (Land Use) Biodiversity	The Proposed Project, if constructed, will result in the loss of agricultural land. This will result in a change of land use from agriculture land to renewable energy, and a loss in habitat which will impact on biodiversity. The impact on biodiversity is expected to be slight to imperceptible following mitigation. However, enhancement measures are included within the Biodiversity Enhancement Management Plan which will result in no net loss of biodiversity.



INTERACTION	DESCRIPTION
Soils, Geology & Hydrogeology, Noise & Vibration, Biodiversity Hydrology & Water Quality	<p>During the construction phase there is potential for impact to biodiversity including bird species during, vegetation clearance and movement of soil and operating machinery. Secondary habitat degradation may occur through a deterioration in water quality as a result of earthworks. Mitigation measures have been set out in Chapter 6: Soils, Geology and Hydrogeology and Chapter 7 Hydrology &amp; Water Quality in order to avoid impacts on water quality and aquatic species and habitat. Mitigation measures have been set out in Chapter 5: Biodiversity to avoid impacts on species and habitats including avifauna and mammals during construction.</p>
Air Quality & Climate Population & Human Health Material Assets	<p>The operational phase of the Proposed Project will result in the production of clean sustainable electricity which will offset the burning of fossil fuels and carbon emissions, resulting in positive benefit to air quality. This will result in an overall benefit to human health. The renewable electricity generated will provide greater energy security to the national grid, reducing the nation's dependency on fossil fuel and reducing the costs associated with fossil fuel importation. Therefore, this will have a positive impact on both material assets and a positive impact on air quality, displacing between 24,522 and 34,331 tonnes of CO2 emissions per annum which would otherwise be released to the atmosphere as a result of the burning of fossil fuels. This will also benefit in reducing the impacts of climate change.</p>
Noise & Vibration Landscape & Visual Population & Human Health (including Shadow Flicker)	<p>The operational phase of the Proposed Project has potential to impact on residential amenity and human health as a result of a combination of noise, visual impact and the effects of shadow flicker on nearby residential receptors. These impacts have been considered in Chapter 9: Noise &amp; Vibration, Chapter 10: Population, Human Health &amp; Material Assets (including Shadow Flicker) and Chapter 8: Landscape &amp; Visual. Mitigation has been set out where relevant.</p> <p>The calculated shadow flicker periods, can be input into the turbine control software and when the correct conditions are met i.e. the light intensity is sufficient, the turbine is operational and orientated towards the receptor, the event is within a calculated potential period of shadow flicker, and the thresholds identified in the WEDG 2006 have been exceeded (30 minutes per day or 30 hours per year of shadow flicker), individual turbines will cease operation (allowing for a short period for the control software to react and for the turbine blades to gradually slow down) until the conditions for shadow flicker are no longer present.</p> <p>The predicted noise from the Proposed Wind Farm is within the daytime and night-time noise limits at all but one non-stakeholder NSL (H28). This location is a Garreneragh stakeholder property and exceeds the limits as a result of the adjacent Garreneragh windfarm. Noise from the Proposed Wind Farm only is within the criteria at this property. No noise mitigation is proposed at this location as the noise levels are determined by Garreneragh Windfarm. There are two stakeholder properties (H34 and H36) that exceed daytime and night time limits, as discussed in previous sections. Again, no noise mitigation is proposed for these properties. The stakeholder properties have been made aware of the exceedances and are happy to proceed on this basis.</p>



INTERACTION	DESCRIPTION
<p>Population &amp; Human Health (Recreation, Amenity &amp; Tourism)            Landscape &amp; Visual            Archaeological, Architectural &amp; Cultural Heritage</p>	<p>The operational phase of the Proposed Project has potential to impact on landscape and cultural heritage which may have an effect on tourism in the area. As outlined in Chapter 12: Archaeological, Architectural &amp; Cultural Heritage, there are no state care national monuments located in proximity to the site. Similarly, there are no major tourism attractions in proximity to the site as detailed in Chapter 10. The operational phase of the Proposed Development will result in no predicted direct impacts on the known archaeological, architectural and cultural heritage resources. Furthermore, with the successful implementation of the construction phase mitigation, there will be no predicted direct impacts on any such potential unrecorded archaeological sites during the construction phase. No residual impacts on architectural heritage and undesignated cultural heritage resources are predicted to arise following decommissioning of the wind farm. As further outlined in Chapter 10: Population, Human Health &amp; Material Assets, the Proposed Wind Farm does not have a significant impact on Tourism as concluded from studies conducted by Fáilte Ireland. Therefore, the impacts associated with landscape and visuals during the operational phase of the Proposed Development will not have a significant impact on Population &amp; Human Health (Recreation, Amenity &amp; Tourism) and Archaeological, Architectural &amp; Cultural Heritage.</p>
<p>Soils, Geology &amp; Hydrogeology,            Hydrology &amp; Water Quality            Population &amp; Human Health            Material Assets            Biodiversity</p>	<p>The potential susceptibility of the Proposed Project to major accidents and natural disasters is considered in Chapter 10: Population, Human Health &amp; Material Assets. This assessment considers the Proposed Project’s vulnerability to major accidents and natural disasters, potential adverse impacts on human health and the environment, the magnitude of potential impacts, the likelihood of potential impacts and considers the preparedness of the project in case of accident, disaster or emergency.</p> <p>Regarding biodiversity, the main possible impacts are considered to be the release of sediment and pollutants into watercourses, which could negatively impact upon aquatic habitats and species.</p> <p>Slope stability has been considered in Chapter 6: Soils, Geology and Hydrogeology. Mitigation measures to reduce impacts on geology, hydrogeology and slope stability, has meant that the infrastructure has been primarily located within areas of thinner soft ground and lower slope.</p> <p>Flood risk is considered in Chapter 7: Hydrology &amp; Water Quality and had regard to the potential impact flooding might have on slope stability. The flood risk assessment concluded that the Proposed Development will not result in a significant alteration to the existing hydrological regime and will not result in significant increase in run-off.</p> <p>Safety mitigation measures have been built into the design of the Proposed Development to avoid potential for fire and avoid potential for the spreading of fire as set put in Chapter 10: Population, Human Health &amp; material Assets, including significant setback between infrastructure and tree lines, and significant setback of the Proposed Wind Farm from occupied buildings and other infrastructure.</p>



## 15.2 Conclusions

The Proposed Project has potential to impact on various environmental aspects as detailed throughout this EIAR. As outlined in this Chapter, there are interactions and inter-relationships between these aspects as described above. The EIAR has considered these interactions and inter-relationships throughout the assessment, firstly through the design of the Proposed Wind Farm site, the Proposed Substation, AGCR and TDR, to avoid impacts where possible and also in the definition of suitable mitigation measures to minimise potential impacts. It is therefore considered that the potential for significant impacts associated with the interactions of environmental effects outlined in this chapter will be avoided due to the implementation of mitigation measures as detailed throughout this EIAR.

## 15.3 References

European Commission (1999), Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. Office for Official Publications of the European Communities, May 1999

Environmental Protection Agency (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. EPA

European Commission (2017), Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report. Publications Office of the European Union





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