

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED CROAGHAUN WIND FARM, CO. CARLOW

VOLUME 2 – MAIN EIAR

CHAPTER 17 – INTERACTIONS OF THE FOREGOING

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17. INTERACTIONS OF THE FOREGOING

17.1 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)¹, the EPA’s Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017)², and the European Commission’s Guidance on the Preparation of the Environmental Impact Assessment Report (2017)³

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, Land, Soils & Geology, Hydrology & Water Quality, Population & Human Health, Material Assets, Shadow Flicker, Traffic & Transportation, Archaeology, Architectural & Cultural heritage, Landscape & Visual and Telecommunications & Aviation, as a result of the proposed project as described in Chapter 3 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 wind farm, grid route and turbine delivery route (TDR).

¹ 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

² Environmental Protection Agency (2017), Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. EPA

³ European Commission (2017), Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report. Publications Office of the European Union



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 Land, Soils and Geology has had regard to potential impacts on both Biodiversity, Hydrology & Water Quality and Traffic & Transportation.

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

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

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



Table 17-2: Description of Actions Between Key Environmental Aspects

INTERACTION	DESCRIPTION
Land, Soils & Geology Air Quality & Climate Traffic & Transportation Population & Human Health	During the construction phase of the proposed project there is potential for impact to human health as a result of construction activities. Excavation works can lead to the migration of dust which can impact on air quality which can impact on human health at nearby dwellings. This is further exacerbated by the increase in traffic movements associated with the construction phase which can spread dust. This potential impact is unlikely to occur at the wind farm site due to the setback of the proposed construction site from nearby dwellings. There is greater potential for this impact to occur along the grid route where installation works will be located in close proximity to dwellings. Due to the rolling nature of the proposed grid route works, this will have a short-term, temporary and slight impact on nearby dwellings. Mitigation measures have been set out in Chapter 6: Air Quality & Climate, Chapter 9: Land, Soils & Geology, Chapter 11: Population, Human Health & Material Assets and Chapter 13: Traffic & Transportation to avoid the impact of dust on nearby residential properties. Mitigation measures include the use of a water bowser to spray down work areas in times of dry weather, the use of specific haul routes, 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.
Land, Soils & Geology Air Quality & Climate Biodiversity Traffic & Transport	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 which can occur up to 25m from sources and soiling effects which can occur up to 100m from sources. This is likely to occur as a result of excavation and the migration of dust, which can be exacerbated by traffic movements. This can impact on air quality, plant species and habitat. Mitigation has been set out in Chapter 6: Air Quality & Climate, Chapter 8: Biodiversity, Chapter 9: Land, Soils & Geology and Chapter 13: Traffic & Transportation in order to reduce potential soiling and vegetation affects including use of water bowser to spray areas during dry periods and the covering of loads which may be sources of dust migration. Designated haul routes and appropriate storage of soils in accordance with the soils management plan will be utilised to control this potential impact.
Noise & Vibration Land, Soils & Geology Air Quality & Climate Traffic & Transportation Population & Human Health	During the construction phase of the proposed project the construction works in combination with the projected increase in traffic has the potential impact on human health and residential amenity by causing noise and dust nuisance at nearby dwellings. Project noise levels at the wind farm site are not expected to exceed limits and the setback distance from the construction site to nearby dwellings will avoid impact from soiling effects. The use of designated haul routes will control the spread of dust and noise as a result of the increased traffic movements. Noise impacts at the proposed off-site substation at Kellistown will be within limits and the setback distance from nearby dwellings will result in limited impact from dust nuisance. The proposed grid route works will result in elevated noise levels at nearby dwellings and will be above the guideline limits in some instances. Mitigation measures include the use of temporary barriers to reduce noise impact and the use of a dust control plan to mitigate against the dispersal of dust. Vehicles and machinery in proximity to dwellings will be turned off when idle to reduce impact of noise. Due to the rolling nature of these works, the impact is expected to be significant, brief/temporary and localised. Potential impacts along the turbine delivery route (TDR) may occur due to the construction of temporary accommodation works to facilitate the delivery of large turbine components.



INTERACTION	DESCRIPTION
	Mitigation is set out in Chapter 6: Air Quality & Climate, Chapter 7: Noise & Vibration, Chapter 9: Land, Soils & Geology and Chapter 13: Traffic & Transportation to reduce the potential impact these construction activities may have on residential amenity and human health..
Hydrology & Water Quality Land, Soils & Geology Biodiversity Traffic & Transportation	The construction phase of the proposed project has potential to impact on water quality, aquatic biodiversity and habitats as a result of excavation and tree felling. 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, including the wind farm site and TDR. Furthermore, the potential for spillage of hydrocarbons from refuelling or from malfunctioning machinery also has potential to impact on water quality and aquatic biodiversity. Excavation works associated with the installation of the grid connection may result in suspended solids reaching watercourse, affecting water quality and biodiversity. Suspended solids also have the potential to reach watercourses by being transported from the construction site to the public road on the wheels of construction traffic. This has potential to migrate to roadside drains. Mitigation measures have been set out in Chapter 8: Biodiversity, Chapter 9: Land, Soils & Geology, Chapter 10: Hydrology & Water Quality and Chapter 13: Traffic and Transportation, in order to reduce potential impact on watercourses and biodiversity. This includes the use of silt fencing, the avoidance of excavations in adverse weather conditions and the use of bunded hydrocarbon stores and refuelling areas. Mitigation by design has also been included in the project. The setback of proposed works from watercourses will reduce potential sediments from reaching water courses and the use of horizontal directional drilling will avoid instream works at a number of locations.
Land, Soils and Geology 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 on ground water and the water of the aquifer beneath the wind farm site and grid route area. 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. Mitigation measures are set out in Chapter 9: Land, Soils & Geology and Chapter 10: Hydrology & Water Quality to avoid potential impact on ground water. Furthermore, there are no recorded groundwater supply wells in proximity to the turbine locations and borrow pit where potential for impact to ground water is highest. Excavations associated with the substations, tracks, compound and grid route will not extend into the underlying bedrock aquifer.
Land, Soils and Geology 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 wind farm site. Soil compaction can reduce the infiltration of water and may result in areas of standing water which pose potential health and safety issues to construction workers and the general public. There is potential for silt to be carried from the construction site to the public road on the wheels of construction traffic which can cause the soiling of the public road, reducing skid resistance and causing a potential traffic hazard. Mitigation measures have been set out in Chapter 9: Land, Soils & Geology, Chapter 10: Hydrology & Water Quality, Chapter 11: Population, Human Health & Material Assets and Chapter 13: Traffic & Transportation in order to reduce the potential for the migration of soil to the public road, reduce potential for soil compaction,



INTERACTION	DESCRIPTION
	reduce the occurrence of standing water and maintain best practice health and safety standards on-site and off-site during construction.
Land, Soils & Geology Material Assets	The construction of the proposed project will result in the excavation of an on-site borrow pit which will impact on the geology of the wind farm site and impact on an exhaustive resource. Site-won granular fill is expected to be up to 45,000m ³ . Demand will also be placed on nearby quarries where further fill will be sourced. This will have a negligible impact on exhaustive resources. Soils excavated from the site that will not be used in the construction of the project or used in the reinstatement of the borrow pit will be disposed of at a licenced waste facility. This will also impact on the capacity of these waste facilities but is likely to have a negligible impact.
Hydrology & Water Quality Biodiversity	During the construction and decommissioning phases of the proposed project, sanitary waste and material waste accumulated at the construction 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 3.1, all on-site waste will be stored appropriately and disposed of at a licenced waste facility.
Population & Human Health (Land Use) Biodiversity Material Assets	The construction of the project will result in the felling of 25.7 hectares of coniferous forestry. This will result in a change of land use from commercial forestry to renewable energy, a loss in habitat which will impact on biodiversity and a loss in renewable material assets (trees). The impact on biodiversity is expected to be imperceptible and the impact on material assets will be neutral due to the requirement to provide replant lands elsewhere. The proposed replant lands are located at Sroove, County Sligo and Crag, County Limerick and will provide the required area of commercial forestry offset by the proposed project.
Land, Soil & Geology, Noise & Vibration, Biodiversity Hydrology & Water Quality	During the construction phase there is potential for impact to biodiversity including bird species during felling, vegetation clearance and movement of soil and operating machinery. These activities will generate noise with potential to displace species and impact on foraging and nesting habitats at the Wind Farm, Grid Route and TDR. Secondary habitat degradation may occur through a deterioration in water quality as a result of earthworks. Prior to mitigation, potential impacts on avifauna are considered temporary and moderate to imperceptible and potential impacts on aquatic species and habitats are considered temporary and significant during the construction period. Mitigation measures have been set out in Chapter 9: Land, Soils & Geology and Chapter 10: Hydrology & Water Quality in order to avoid impact on water quality and aquatic species and habitat. Mitigation measures have been set out in Chapter 8: Biodiversity to avoid impact on species and habitats including avifauna and mammals during construction. Measures include all felling and clearing of vegetation will be carried out outside of the breeding season for birds and night-time works will be limited to avoid impact on bats. Pre-construction monitoring surveys will be undertaken and an Ecological Clerk of Works will be present to oversee the construction works. Mitigation measures have been set out in Chapter 7: Noise & Vibration to reduce noise where possible during the construction phase of the project. Following implementation of mitigation measures, the potential impact to species and habitat as a result of this potential interaction is considered non-significant and short term.
Population & Human Health (Recreation, Amenity & Tourism and	The construction and decommissioning phases of the proposed development will result in the closure of the wind farm site to the public. This includes a section of walking trail associated with the South Leinster Way, Colombun Way and the



INTERACTION	DESCRIPTION
Human Health & Safety) Traffic & Transportation Noise & Vibration	Kilbrannish Recreation Trail. During the construction phase the South Leinster Waywill be redirected onto a new route that includes a number of alternative recreation trails through Coillte property and a minor section of Public road. The increased traffic volumes and noise associated with construction activities will have a negative impact on recreation and amenity at the site and has potential to impact on human safety or members of the public who wish to use the recreation trails during construction. These impacts are temporary in nature and mitigation will be put in place to maintain safety for walkers using the area for recreation activity, as set out in Chapter 11: Population, Human Health and Material Assets. And Chapter 13; Traffic & Transportation.
Air Quality & Climate Population & Human Health (Human Health & Recreation, Amenity & Tourism)	The operational phase of the proposed development will result in the provision of new recreation facilities at the wind farm site providing opportunity for recreation activities and health gain (exercise) for locals and visitors. The operational phase will also 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, in combination with the health gain provided by the proposed recreation facilities will result in an overall benefit to human health.
Air Quality & Climate Material Assets	The operational phase of the proposed project will contribute to the displacement of use of fossil fuels required in electricity generation; providing greater energy security to the national grid, reducing the nation’s dependency on fossil fuel and reducing the costs associated with fossil fuel imports. This will have a positive impact on material assets and a positive impact on air quality, displacing up to 53,118 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 benefit in reducing climate change.
Noise & Vibration Landscape & Visual Shadow Flicker Population & Human Health	The operation phase of the proposed project has potential to impact on residential amenity and human health as a result of noise, visual impact and the effects of shadow flicker on nearby residential receptors. These impacts have been considered I Chapter 7: Nosit & Vibration, Chapter 11: Population, Human Health & Material Assets, Chapter 12: Shadow Flicker and Chapter 15: Landscape & Visual. Mitigation has been set out where relevant. The predicted noise limits will fall within the guideline noise limits at the site. Where cumulative noise limits are exceeded, mitigation will be put in place which includes noise reduction modes for specific turbines. The occurrence of shadow flicker if experienced will be reduced through the installation of shadow flicker detection systems on each wind turbine. A significant setback distance has been applied between the proposed turbines and nearby residential dwellings. The closest dwelling to the turbine locations is 984m. This provision aims to provide adequate setback in order to maintain residential amenity at nearby dwellings, reduce visual, noise and shadow flicker impact with the assessments in carried out in accordance with national guidelines.
Population & Human Health (Recreation, Amenity & Tourism) Landscape & Visual Archaeological, Architectural & Cultural Heritage	The operational phase of the proposed development has potential to impact on landscape and cultural heritage which may have an effect on tourism in the area. As outlined in Chapter 14: Archaeological, Architectural & Cultural Heritage, there are no visually sensitive monuments in proximity to the site. Monuments with associated alignments within 10km are not aligned with the proposed development. The major tourism and recreation attractions in the area have been identified as Mount Leinster to the South of the site and the Nine Stones to the South West of the site. The assessment of visual impact of these features, as detailed in Chapter 15: Landscape & Visual, indicates that there will be a clear view



INTERACTION	DESCRIPTION
	<p>of the proposed development from Mount Leinster and Nine Stones and there will be a substantial to moderate impact on the panoramic views from these features. However, the proposed development will not be viewed in the most sensitive aspect of the scenic designation which is to the west/north west and will not significantly detract from these views. Mitigation by design has been incorporated into the layout of the proposed development and is well assimilated into the landscape of coniferous forestry and the existing Greenoge Wind Farm. The proposed development will therefore not be considered an unfamiliar sight due to the existing renewable energy development of the adjacent Greenoge Wind Farm. As further outlined in Chapter 11: Population, Human Health & Material Assets, wind farm development does not have a significant bearing 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 & Human Health (Recreation, Amenity & Tourism) and Archaeological, Architectural & Cultural Heritage.</p>
<p>Land, Soils and Geology Hydrology & Water Quality Population & Human Health Material Assets Biodiversity Architectural & Cultural Heritage</p>	<p>The potential susceptibility of the project to major accidents and natural disasters is considered in Chapter 11: Population, human Health & Material Assets. This assessment considers the potential impact of landslides/slope failure, forest fire and flooding. These events have potential to impact on soils and geology, hydrological regimes, water quality, human health and safety of construction workers, forestry workers and the general public, material assets including property, roads and infrastructure and natural resources, biodiversity and archaeological monuments. Slope stability has been considered in Chapter 9: Land, Soils and Geology where the lands of the proposed project were found to be stable in the slope stability assessment. Flood risk was considered in Chapter 10: Hydrology & 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. This was also assessed with a 10% increase predicted run-off flow to account for potential future climate change. Safety 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 11: Population, Human Health & material Assets.</p>



17.2 Conclusions

The proposed Croaghaun Wind Farm 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 wind farm site, grid connection route and turbine delivery route, to avoid impacts where possible and also in the definition of suitable mitigation measures to minimise potential impacts. It is therefore considered that the 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.

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