

17 INTERACTIONS OF THE FOREGOING AND A SUMMARY OF MITIGATION MEASURES

17.1 INTERACTIONS OF THE FOREGOING

17.1.1 Introduction

The purpose of this Chapter is to identify significant interactions and interdependencies in the existing environment and set out the likely interactions of, and between effects predicted as a result of the Project. Impact interactions and inter-relationships have been considered throughout the EIA process. The foregoing topics in earlier chapters do not exist in isolation from each other and consequently, any impact on one element of the environment may also affect another.

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 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 and e) the interaction between the factors referred to in points (a) to (d)."

17.1.2 Effect Interactions

Where any potential negative effects have been identified during the assessment process, these effects have been avoided by embedded design mitigation or at a minimum, reduced by the proposed mitigation measures.

17.2 SUMMARY OF MITIGATION MEASURES

This Chapter summarises mitigation measures proposed elsewhere in the EIAR. Chapter 4 to 16 of the EIAR outlines the findings of the assessment of the predicted effects of the Development on a topic-by-topic basis. The significance of these effects has been assessed using criteria defined in the topic chapters. In the context of The EPA Guidelines (2022), the significance of effects is categorised from imperceptible through to not significant, significant and profound with varying sub-categories.

17.2.1 Embedded Mitigation

Embedded mitigation includes design changes that were made to reduce or eliminate adverse effects, as well as normal good practice measures; these have avoided the majority of potentially significant effects. **Appendix 17.1** summarises mitigation measures for all technical assessment chapters.

The process of applying the embedded mitigation is set out in **Chapter 2: Project Description**. The key design aspects comprising embedded mitigation include:

- Avoiding inconsistent turbine spacing, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array of key views has allowed for a reduction in adverse effects from a landscape and visual effect perspective.
- Evaluating both the landscape and planning policy objectives set out in the County Clare Development Plan 2023 – 2029 has influenced an appropriate scale of turbine, taking account of the landscape context of the local area.
- Respecting and understanding the ground conditions and site topography, including minimising effects on active peat where possible, and incorporating a biodiversity enhancement management plan into two sections of the Development. Maximising the separation from residential dwellings to avoid or reduce visual, noise and shadow flicker effects on residential dwellings.
- Respecting other environmental constraints and associated buffer separations

17.2.2 Specific Mitigation Measures

In addition to mitigation proposed to address significant adverse effects (**Appendix 17.1**), certain chapters have also proposed further measures to reduce effects that were assessed as 'Not Significant' before mitigation.

Table 17.2 outlines interactions between environmental aspects. Technical assessments have assessed pathways, both direct and indirect that can magnify effects through the interaction or accumulation of effects. Effects have been cross-referenced between chapter topics. An outline of potential interactions between chapters/topics is presented in **Table 17.1**.

Table 17.1: Summary matrix of Interactions of Effects during Construction, Operational and Decommissioning Phases (Source: Adapted from EIAR Guidelines, 2022)

	Population & Human Health		Planning Policy		Biodiversity		Soils & Geology		Hydrology and Hydrogeology		Noise		Landscape & Visual		Material Assets		Cultural Heritage		Traffic & Transportation		Shadow Flicker		Air And Climate	
	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper
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Hydrology and Hydrogeology																								
Noise																								
Landscape & Visual																								
Material Assets																								
Cultural Heritage																								
Traffic & Transportation																								
Shadow Flicker																								
Air And Climate																								

Note: Const. = Construction phase; Oper = Operational phase Decom. = Decommissioning

Interaction or inter-relationship

No interaction or inter-relationship

Table 17.2: Interactions & Inter-relationships between Environmental Aspects of the Development

Interaction	Description
Population and Human Health & Hydrology and Hydrogeology	Effects could arise from flood risks impacting water supply and recreational fisheries, which are addressed in Chapter 9: Hydrology and Hydrogeology. In line with recommended mitigation measures, potential effects from surface water and groundwater pollution will be avoided, ensuring no increased impact on population and human health. From a cumulative effects perspective, potential cumulative effects, such as a reduction in surface water or groundwater resources, are considered Not Significant. No significant impacts have been identified from existing or proposed developments in the study area.
Population and Human Health & Noise	The noise assessment accounts for all interactions, as its methodology and applied limits are designed to protect health and amenity. No Significant noise effects are anticipated on population and human health receptors during the construction, operation, or decommissioning phases of the project. The cumulative effects assessment also concludes that the project, in combination with other existing or proposed developments in the study area, will result in No Significant Effects on population and human health receptors.
Population and Human Health & Landscape and Visual	The construction phase of the Project will see a temporary introduction of machinery and the erection of three turbines into a natural but already modified landscape. Chapter 11: Landscape and Visual Amenity assessed the landscape effects, the visual effects and the cumulative effects of the Project, including assessment from recreational scenic viewpoints, and was also informed by the findings of the Assessment. The interactions between the environmental aspects were carefully considered in the EIAR, particularly in the design of the turbine layout. Detailed zone of theoretical visibility maps (ZTVs), route screening analysis and photomontages were prepared to assess the level of impact. Based on the findings of the collective assessments it is considered that the Project will not give rise to any significant effects, either singly or in combination. Tourists to Ireland have become accustomed to the vision of turbines on the landscape and given the scenario where more windfarms will be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again.
Population and Human Health & Material Assets:	Shadow flicker could potentially effect residences in the absence of mitigation measures. The results from the shadow flicker assessment presented in Chapter 13: Shadow Flicker and EMI show the projected total hours of shadow flicker occurrences per year in the absence of mitigation. The shadow flicker assessment study identified no significant effects to local residences, given that predicted shadow flicker effect incidence is forecast to be less than prevailing European guidance for shadow flicker. Therefore, even without mitigation it is unlikely to cause a significant effect to local inhabited dwellings, which are greater than ten rotor diameters from the turbines (1,360m). The shadow flicker and EMI assessment chapter also discusses software that is installed in the proposed turbines to enable remote control/ stopping the turbines when shadow flicker is predicted. The assessment identified no significant effects, given that shadow flicker is unlikely to cause a nuisance to nearby inhabited dwellings which are greater than ten rotor diameters from the turbines. It also notes that the function to stop the turbine if required to do so, is available.
1. Shadow Flicker	
2. Air Navigation	
3. Telecommunications	
4. Socio-economic	

Interaction	Description
	The potential effects of the Development from shadow flicker are considered to be Not Significant. - Operating wind farms have the potential to impact aviation operations, particularly those involving radar systems. The movement of wind turbine blades can interfere with radar signals, and turbine heights may obstruct aviation pathways, affecting the performance of communications, navigation, and surveillance equipment. In compliance with aviation safety standards, any structure exceeding 150 meters in height must be equipped with obstacle lighting to alert aviation traffic. As part of the Project, an aviation constraints analysis and pre-planning consultations with relevant aviation stakeholders were conducted to address these potential impacts. This ensured that the proposed development aligns with safety regulations and operational requirements. No Significant effects on human safety or air navigation are anticipated. In accordance with the Irish Aviation Authority (IAA) Safety Regulations and ICAO Annex 15, the following measures will be implemented: - Installation of aeronautical obstacle warning light schemes as specified by the IAA. - Submission of accurate ground and tip height coordinates for each turbine. - Notification to the IAA at least 30 days before the commencement of crane operations. - These measures will ensure compliance and mitigate potential risks to aviation safety. - Wind turbines have the potential to interfere with electromagnetic signals due to their size and operational nature. During the operational phase, electromagnetic signals passing above ground, such as telecommunication and microwave links, could be impacted. Additionally, during the construction phase, signals transmitted via underground infrastructure, including communication cables, may be affected. These could encompass business radio, television reception, and other telecommunication systems. To mitigate these risks, proactive measures were integrated into the design phase. This included identifying the routes of telecommunication links and applying buffer zones around them to ensure that turbines were positioned outside these areas. As part of the Environmental Impact Assessment (EIA) scoping and pre-planning consultations, RTE confirmed that the proposed development would not affect their fixed communication links. However, they requested a Protocol Agreement to address potential interference with broadcast services. The Applicant has agreed to enter into such an agreement should the project receive planning permission, ensuring compliance and safeguarding communication infrastructure. In the operational phase, all electrical components, equipment, apparatus and systems will be required by Irish and European law to comply with the EMC Directive 2014/30/EU. Compliance with this Directive will mean that the electromagnetic emissions from these devices will not cause interference to other equipment. Turbine and substation control electronics will be typical of any circuits used by industry or a conventional generating station. There is no potential for interference with telecommunications or radio links from other wind farms in combination with the development.

Interaction	Description
	Due to the remote location of the site, the nearest non-sensitive receptor (a tack room) is 571 meters from Turbine 3, and the nearest sensitive receptors are H2 which is 609 meters from Turbine 1 and H3 which is 609m from T3. No significant impacts on telecommunications or radio reception are anticipated as a result of the development. The Development will provide opportunities for local suppliers to be engaged in the construction and decommissioning phase. This will be a minor beneficial effect. The developer will seek to secure positive benefits for the local/regional economy by encouraging the use of local labour, manufacture and suppliers where possible. They will hold 'Meet the Developer' days prior to construction to allow local contractors to engage with the process and maximise opportunities.
Population and Human Health & Cultural Heritage	Damage to cultural assets could potentially impact tourism; however, this has been carefully evaluated in Chapter 14: Archaeology and Cultural Heritage. The findings indicate that any effects will be Not Significant, ensuring no substantial impact on tourism or cultural heritage.
Population and Human Health & Air and Climate	Effects on air quality during the construction and decommissioning phase may occur due to dust emissions from construction activities onsite and through increased traffic and associated exhaust emissions from construction traffic. These interactions have been considered as part of the EIAR, without significant effects being predicted and suitable mitigation measures provided to further reduce potential effects. During the operational phase, the energy generated by the Development will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a net positive effect on climate. In doing so, there will likely be reduced effects from climate change on human beings. The cumulative effect of the Development with other Irish renewable generation is considered to be a fundamental change in the climate effects of Ireland's energy supply, which is a major, positive effect, that is Significant (beneficial) under the EIA Regulations and will contribute to Ireland's binding emission reduction targets.
Population and Human Health & Traffic and Transport	The construction and decommissioning phases will involve the movement of abnormal loads, which may cause short-term inconvenience for road users. To minimise disruption, a comprehensive Traffic Management Plan (TMP) will be implemented, ensuring efficient coordination of transport activities. Mitigation measures to reduce dust emissions and other potential nuisances have been detailed in Chapter 16: Traffic and Transportation. These measures include strategies to maintain road safety and minimise impacts on air quality. Cumulative effects on population and human health from construction traffic, including delivery schedules for the Moanmore Lower Wind Farm and other regional projects, are not anticipated to be significant. Overall, the impacts on population and human health related to traffic and transport are assessed as short-term, with a low magnitude of effect, classified as Not Significant.
Biodiversity	All interactions for any habitat or species including those associated with Special Protection Areas (SPA) or Special Areas of Conservation (SAC) are considered in the Natura Impact Statement and not considered further here.
Biodiversity & Soils and Geology	Potential impacts on biodiversity during the construction and decommissioning phases may include disturbance to birds and mammals due to habitat loss or alteration. Sensitive habitats, such as Annex I peatlands, wet heath, dry heath, and siliceous rock habitats, could be affected. Where possible, these impacts will be mitigated, with habitat restoration efforts carried out in accordance with the Biodiversity Enhancement Management Plan Mitigation measures detailed in Chapter 8: Soils and Geology will also be implemented to minimise effects on biodiversity. These measures aim to reduce potential impacts to

Interaction	Description
	a low or negligible significance level, ensuring effective protection of biodiversity receptors throughout the project lifecycle.
Biodiversity & Hydrology and Hydrogeology	Potential contamination of surface water and groundwater could arise from various elements of the proposed development, including wastewater sanitation, hydrocarbon spills, construction of watercourse crossings, and the entrainment of suspended solids during earthworks. Other sources of contamination may include increased pollutant transport due to local stability issues. Such contamination could adversely affect water quality, impacting flora and fauna, including fisheries, otters, lizards, amphibians (e.g., loss of breeding ponds), and other sensitive species. To mitigate these risks, the following measures will be implemented: • Lagoon-type sediment traps and plant filtration beds will be installed in watercourses to protect freshwater species such as the freshwater pearl mussel. • Interceptor drains and silt fences will be used to prevent silt-laden runoff, safeguarding aquatic habitats. These interactions have been thoroughly considered in the Environmental Impact Assessment Report (EIAR). Mitigation measures outlined in Chapter 9: Hydrology and Hydrogeology will be implemented to reduce potential effects on biodiversity receptors. With these measures in place, the significance of impacts on water quality and associated ecosystems will be minimized to a low or negligible level.
Biodiversity & Hydrology and Hydrogeology	There is a potential for Fisheries to be affected by a disturbance or contamination of watercourses during the construction period if the stated mitigation measures are not adhered to. However, the mitigation measures to protect watercourses outlined in Chapter 7: Aquatic Ecology, Chapter 8: Soils and Geology and Chapter 9: Hydrology and Hydrogeology will be strictly adhered to which includes monitoring of Site water run-off during all phases of the Project.
Soils and Geology & Hydrology and Hydrogeology & Landscape and Visual	During the design phase, the EIA team employed a "mitigation by avoidance" approach when developing the layout for turbines and associated infrastructure. This process aimed to minimise any potential impacts on the site's hydrogeological balance, particularly concerning the volume of earth materials that would need to be excavated. To ensure minimal impact, best practices will be followed, with proactive planning and real-time monitoring of more sensitive areas (e.g., those with peat depths greater than 1 meter). This approach will help mitigate any disturbances during excavation activities associated with the development. These potential interactions were carefully evaluated in the Environmental Impact Assessment Report (EIAR), which outlines appropriate mitigation measures. The implementation of these measures will reduce the risk of stability issues and limit any adverse effects on local hydrology and hydrogeology. Mitigation measures, as detailed in Chapter 8: Soils and Geology, will ensure that any effects on hydrology and hydrogeology receptors are minimised to a negligible significance level. The project layout was carefully reviewed to identify the most appropriate design that protects the site's geotechnical and hydrological regime while accommodating engineering constraints and avoiding other environmental and ecological sensitivities.
Soils and Geology & Landscape and Visual	The unavoidable residual effects on the soils and geology environment as a function of the Development is that there will be a change in ground conditions at the Site with the replacement of natural materials such as peat, subsoil and bedrock by concrete, subgrade and surfacing materials. The details of these measures for ensuring ground stability and eliminating or reducing risk of slope failure to an acceptable level are outlined in Chapter 8 Soils and Geology

Interaction	Description
	and addressed in the CEMP (Appendix 2.1) No new effects are anticipated during the operational phase of the Project. The implementation of mitigation recommendations outlined in Chapter 8: Soils and Geology will incur an imperceptible effect in terms of Landscape and Visual receptors.
Soils and Geology & Archaeology and Cultural Heritage & Landscape and Visual	The construction and decommissioning phases of the development will involve significant ground disturbance and topsoil removal throughout the project footprint. While no direct adverse effects are expected on known archaeological sites, designated architectural heritage structures, or undesignated cultural heritage constraints, there remains the potential for unrecorded, sub-surface archaeological features to be discovered within the construction areas. During both the construction and decommissioning phases, there is a possibility of encountering archaeological finds as the disturbed soil area increases. These potential interactions were carefully considered in the Environmental Impact Assessment Report (EIAR), which included an assessment of the turbine layout and the design of appropriate mitigation measures. As part of these measures, ongoing monitoring will be conducted, including a watching brief in undisturbed portions of the project footprint. Any archaeological records discovered will be preserved and documented. Regarding the operational phase, no significant or likely direct effects on cultural heritage resources are anticipated.
Noise & Traffic and Transportation	Traffic and Transportation will create noise onsite and along the Site Access Roads. Site contractors will be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228. Such potential effects are considered to be not significant.
Landscape and Visual & Material Assets	The Irish Aviation Authority (IAA) has outlined criteria regarding tall structures and the installation of an aeronautical obstacle warning light scheme for the Development. This has been addressed in Chapter 15: Material Assets and Other Issues and is not considered further here.
Traffic and Transport & Biodiversity (Fisheries)	Traffic and Transportation will create noise onsite and along the Site Access Roads. Site contractors will be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228. Such potential effects are considered to be not significant.