Chapter 32:
Interactions

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

A TETRA TECH COMPANY

PARK WIND
JERA GROUP

Energy for generations

ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report
Chapter 32: Interactions

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Contents

32 CHAPTER 32 – INTERACTIONS 1
32.1 Introduction 1
32.2 Legislation 2
32.3 Impact assessment methodology 2
32.4 Interactions matrix 2
32.5 Description of interactions 6
32.5.1 Marine processes 6
32.5.2 Benthic subtidal and intertidal ecology 7
32.5.3 Fish and shellfish ecology 7
32.5.4 Marine mammals and megafauna 8
32.5.5 Offshore ornithology 8
32.5.6 Commercial fisheries 8
32.5.7 Shipping and navigation 8
32.5.8 Aviation, military and communications 9
32.5.9 Marine archaeology 9
32.5.10 Infrastructure, marine recreation and other users 9
32.5.11 Climate 9
32.5.12 Population and human health 10
32.5.13 Onshore biodiversity 11
32.5.14 Land and agriculture 11
32.5.15 Soils, geology and hydrogeology 12
32.5.16 Hydrology and flood risk 12
32.5.17 Air quality 12
32.5.18 Noise (airborne) and vibration 13
32.5.19 Cultural heritage 13
32.5.20 Seascape, landscape and visual amenity 13
32.5.21 Traffic and transport 13
32.5.22 Material assets 14
32.5.23 Resource and waste management 14
32.5.24 Bats in the marine environment 14
32.6 Potential interactive effects across all phases of the Project on receptors 14
References 15

Tables

Table 32-1: Interactions matrix. 4

32 CHAPTER 32 – INTERACTIONS

32.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the potential impacts of the Oriel Wind Farm Project (hereafter referred to as "the Project") in relation to interactive effects during the construction, operational and maintenance, and decommissioning phases.

The potential for interaction of effects has been assessed throughout volumes 2B & 2C of this EIAR, as part of the impact assessment process in the following chapters:

- Volume 2B:
  - Chapter 7: Marine Processes;
  - Chapter 8: Benthic Subtidal and Intertidal Ecology;
  - Chapter 9: Fish and Shellfish Ecology;
  - Chapter 10: Marine Mammals and Megafauna;
  - Chapter 11: Offshore Ornithology;
  - Chapter 12: Commercial Fisheries;
  - Chapter 13: Shipping and Navigation;
  - Chapter 14: Aviation, Military and Communications;
  - Chapter 15: Marine Archaeology; and
  - Chapter 16: Infrastructure, Marine Recreation and Other Users.
- Volume 2C:
  - Chapter 17: Climate;
  - Chapter 18: Population and Human Health;
  - Chapter 19: Onshore Biodiversity;
  - Chapter 20: Land and Agriculture;
  - Chapter 21: Soils, Geology and Hydrogeology;
  - Chapter 22: Hydrology and Flood Risk;
  - Chapter 23: Air Quality;
  - Chapter 25: Noise (Airborne) and Vibration;
  - Chapter 26: Cultural Heritage;
  - Chapter 27: Seascape, Landscape and Visual Amenity;
  - Chapter 28: Traffic and Transport;
  - Chapter 29: Material Assets;
  - Chapter 30: Resource and Waste Management; and
  - Chapter 31: Bats in the Marine Environment.

These chapters identify and assess the relevant impact either on, or from, the other factors.

The detailed technical information which underpins the impact assessments presented in this chapter is contained within chapter 5: Project Description and within the technical EIAR chapters (volumes 2B and 2C) and their supporting appendices. These chapters provide a detailed characterisation of the physical, biological and human environment of the Project, based on desk-based data sources and/or site-specific surveys, including information on receptors of importance and of conservation value.

32.2 Legislation

Article 3(1) of the Environmental Impact Assessment (EIA) Directive requires that the interaction between the factors (population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and the landscape) is identified (see section 32.4), described (see section 32.5) and assessed in the EIAR (see chapters 7-31).

The EPA Guidelines (2022) states that:

> *"The interactions between effects on different environmental factors should be addressed as relevant throughout the EIAR. For example, where it is established in the Hydrology section that there will be an increase in suspended solids in discharged surface waters during construction, then the Biodiversity section should assess the effect of that on sensitive aquatic receptors."*

32.3 Impact assessment methodology

The interactions assessment has been carried out with regard to the following guidelines:

- EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022); and
- The Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission (EC), 1999).

The assessment of interactive effects has considered likely significant effects that may arise during construction, operational and maintenance, and decommissioning phases of the Project. The assessment of interaction of effects has been undertaken on a qualitative basis by each of the environmental specialist leads based on best scientific knowledge. The approach has aligned with the above guidance and chapter 3: EIA Methodology (volume 2A). There is no standard method for assessing interactive effects on receptors and therefore professional judgment has been used to inform the assessment in section 32.6.

The EIAR coordination team facilitated data exchange and subsequent assessment review by the relevant specialists to inform the assessment of interactive effects. This was undertaken throughout the specialist impact assessment process.

32.4 Interactions matrix

The likely relevant interactions between factors are identified in Table 32-1. The effects matrix identifies the factors in the left-hand column, which have the potential to impact on other factors listed in the top row of the matrix.

Where a tick '✓ 'exists, this indicates that the Project results in an interaction between the two factors. Where there is no potential for an interaction between factors, this is indicated by a hyphen '–' in the matrix.

The purpose of the matrix is to identify the likely interactive effects of significance. A description of the interactive effect is provided in section 32.5 along with a reference to where the assessment has been completed in chapters 7-31.

The expected effects deriving from the vulnerability of the Project to risks of major accidents and/or natural disasters are considered in chapter 24: Risks of Major Accidents and Natural Disasters. The assessment of major accidents and disasters identifies cross-disciplinary impacts on the following factors:

- Chapter 7: Marine Processes;
- Chapter 12: Commercial Fisheries;
- Chapter 13: Shipping and Navigation;
- Chapter 14: Aviation, Military and Communications;
- Chapter 16: Infrastructure, Marine Recreation and Other Users;
- Chapter 17: Climate;
- Chapter 20: Land and Agriculture;

- Chapter 21: Soils, Geology and Hydrogeology;
- Chapter 22: Hydrology and Flood Risk;
- Chapter 23: Air Quality;
- Chapter 28: Traffic and Transport; and
- Chapter 29: Material Assets.

Major Accidents and Natural Disasters is not considered further in Table 32-1 or this assessment, as it isn't a factor listed in Article 3 of the EIA Directive.

It should also be noted that marine processes (i.e. currents, waves, and sediment transport) are not receptors in themselves; however, they are potential pathways for impacts on other receptors and therefore are considered in Table 32-1.

Table 32-1: Interactions matrix.

Interaction	Marine Processes	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals and Megafauna	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Marine Archaeology	Infrastructure, Marine Recreation and Other Users	Climate	Population and Human Health	Onshore Biodiversity	Land and Agriculture	Soils, Geology and Hydrogeology	Hydrology and Flood Risk	Air Quality	Noise (Airborne) and Vibration	Cultural Heritage	Seascape, Landscape and Visual Amenity	Traffic and Transport	Material Assets	Resource and Waste Management	Bats in the Marine Environment
Marine Processes																								
Benthic Subtidal and Intertidal Ecology	✓																							
Fish and Shellfish Ecology	✓	✓																						
Marine Mammals and Megafauna	-	-	✓																					
Offshore Ornithology	-	✓	✓	-																				
Commercial Fisheries	-	-	✓	-	-																			
Shipping and Navigation	-	-	-	✓	✓	-																		
Aviation, Military and Communications	-	-	-	-	-	-	-																	
Marine Archaeology	✓	-	-	-	-	-	-	-																
Infrastructure, Marine Recreation and Other Users	✓	-	-	-	-	-	-	✓	-															
Climate	-	-	-	-	-	-	-	-	-	-														
Population and Human Health	-	-	-	-	-	-	-	-	-	-	✓													
Onshore Biodiversity	-	-	-	-	-	-	-	-	-	-	-	-												
Land and Agriculture	-	-	-	-	-	-	-	-	-	-	-	-	-											

ORIEL WIND FARM PROJECT – INTERACTIONS

Interaction	Marine Processes	Benthic Subtidal and Intertidal Ecology	Fish and Shellfish Ecology	Marine Mammals and Megafauna	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation, Military and Communications	Marine Archaeology	Infrastructure, Marine Recreation and Other Users	Climate	Population and Human Health	Onshore Biodiversity	Land and Agriculture	Soils, Geology and Hydrogeology	Hydrology and Flood Risk	Air Quality	Noise (Airborne) and Vibration	Cultural Heritage	Seascape, Landscape and Visual Amenity	Traffic and Transport	Material Assets	Resource and Waste Management	Bats in the Marine Environment
Soils, Geology and Hydrogeology	-	-	-	-	-	-	-	-	-	-	-	-	✓	✓										
Hydrology and Flood Risk	-	-	-	-	-	-	-	-	-	-	✓	-	✓	-	-									
Air Quality	-	-	-	-	-	-	-	-	-	-	-	✓	-	✓	-	-								
Noise (Airborne) and Vibration	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-							
Cultural Heritage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Seascape, Landscape and Visual Amenity	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	✓					
Traffic and Transport	-	-	-	-	-	-	-	-	-	-	✓	✓	-	✓	-	-	✓	✓	-	-				
Material Assets	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Resource and Waste Management	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Bats in the Marine Environment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

32.5 Description of interactions

As indicated in the matrix (Table 32-1) there are linkages between the topic-specific chapters presented within this EIAR, whereby the effects assessed in one chapter have either the potential to result in secondary effects on another receptor (e.g. impacts on fish and shellfish ecology have the potential to result in secondary effects on marine mammals prey resources). These are summarised in the following sections under each topic heading.

32.5.1 Marine processes

As described in chapter 7: Marine Processes, marine processes associated with the physical environment (i.e. currents, waves and sediment transport) are not receptors in themselves, however they are the pathway for impacts on other receptors.

The potential impacts on marine processes during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 7: Marine Processes. A small number of features were identified in chapter 7: Marine Processes as potentially sensitive marine processes receptors, namely Dunany Point pNHA, Carlingford Shore SAC and pNHA and Clogher Head SAC and pNHA. However, there is no pathway and potential for impacts to these sites and therefore no potential for interactive effects on these receptors.

As identified in Table 32-1, effects on marine processes can interact with the following:

- Benthic subtidal and intertidal ecology – impacts may lead to alteration of seabed habitats arising from effects of physical processes, including scour effects and changes in wave and tidal regimes resulting in indirect effects on benthic ecology during the operational and maintenance phase. Furthermore, installation of offshore infrastructure may lead to increases in suspended sediment concentrations and associated sediment deposition resulting in effects on benthic ecology.
  - The impacts resulting from changes in marine processes on benthic subtidal and intertidal ecology have been assessed in:
    - Section 8.10.3: Increased suspended sediment concentrations and associated sediment deposition (construction, operational and maintenance and decommissioning phases); and
    - Section 8.10.7: Alteration of seabed habitats arising from effects of physical processes (operational and maintenance phase).
- Fish and shellfish ecology – there is the potential for increased suspended sediment concentration and associated sediment deposition resulting in indirect effects on fish and shellfish receptors (i.e. through avoidance behaviour, physiological effects, effects on eggs and larvae or smothering effects).
  - The impacts resulting from changes in marine processes on fish and shellfish ecology have been assessed in:
    - Section 9.10.3: Increased suspended sediment concentrations and associated sediment deposition (construction, operational and maintenance and decommissioning phases).
- Marine archaeology – the installation of Project infrastructure within the offshore wind farm area and offshore cable corridor may result in the disturbance of sediment causing sediment deposition on the seabed resulting in potential effects on archaeological receptors.
  - The impacts resulting from changes in marine processes on marine archaeology have been assessed in:
    - Section 15.10.3: Disturbance of sediment causing sediment deposition on the seabed resulting in potential effects on archaeological receptors (construction, operational and maintenance and decommissioning phases).
- Infrastructure, marine recreation and other users – the installation of Project infrastructure within the offshore wind farm area and offshore cable corridor may lead to increases in suspended sediment concentrations and associated sediment deposition which may affect the use of recreational dive sites.
  - The impacts resulting from changes in marine processes on marine infrastructure, marine recreation and other users have been assessed in:

    - Section 16.10.3: Potential for increased suspended sediment concentrations and associated deposition affecting other recreational activities (swimming, diving and angling) (construction, operational and maintenance and decommissioning phases).

Potential impacts from increased suspended sediment concentrations (SSC) and associated sediment deposition on marine mammals and megafauna were scoped out of the assessment (see chapter 10: Marine Mammals and Megafauna).

32.5.2 Benthic subtidal and intertidal ecology

The potential impacts on benthic subtidal and intertidal ecology receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 8: Benthic Subtidal and Intertidal Ecology. As identified in Table 32-1, effects on benthic subtidal and intertidal ecology receptors also have the potential to have secondary effects on the following receptors:

- Fish and shellfish ecology – direct temporary habitat loss/disturbance of subtidal benthic habitats within the offshore wind farm area and offshore cable corridor during the construction, operational and maintenance and decommissioning phases will occur as a result of a range of activities. Disturbance to these habitats has the potential to affect identified fish and shellfish directly (e.g. removal or injury of individuals) and indirectly (e.g. loss of important fish and shellfish habitats, such as spawning grounds).
    - The effects of the Project on benthic and intertidal communities and resulting direct and indirect effects on fish and shellfish have been assessed in:
        - Section 9.10.1: Temporary subtidal habitat loss/disturbance (construction, operational and maintenance and decommissioning phases); and
        - Section 9.10.4: Long-term subtidal habitat loss (operational and maintenance phase).
- Offshore ornithology – seabirds may be indirectly disturbed and displaced during the construction phase as a result of direct impacts on prey species, which may result in the loss of a food resource to birds in the offshore wind farm area and offshore cable corridor.
    - The effects of the Project on benthic subtidal and intertidal communities and resulting direct and indirect effects on offshore ornithology have been assessed in:
        - Section 11.10.2: Indirect displacement resulting from changes to prey and habitats (construction and decommissioning phases).
- Marine processes – these are described above in 32.5.1.

32.5.3 Fish and shellfish ecology

The potential impacts on fish and shellfish ecology receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 9: Fish and Shellfish Ecology. As identified in Table 32-1, effects on fish and shellfish ecology receptors also have the potential to have secondary effects on the following receptors:

- Marine mammals and megafauna – impacts may lead to changes in fish and shellfish community affecting marine megafauna prey resources.
    - The effects of the Project on fish and shellfish ecology and resulting direct and indirect effects on marine mammals and megafauna are assessed in:
        - Section 10.10.4: Changes in the fish and shellfish community affecting marine megafauna prey resources (construction, operation and maintenance and decommissioning phases).
- Offshore ornithology – impacts may lead to changes in the fish and shellfish community affecting seabird prey availability. Seabirds may be indirectly disturbed and displaced during the construction phase because of direct impacts on prey species, which may result in the loss of a food resource to birds in the offshore wind farm area and offshore cable corridor.
    - The effects of the Project on fish and shellfish ecology and resulting direct and indirect effects on offshore ornithology are assessed in:
        - Section 11.10.2: Indirect displacement resulting from changes to prey and habitats (construction and decommissioning phases).

- Benthic subtidal and intertidal ecology – these are described above in section 32.5.2; and
- Marine processes – these are described above in section 32.5.1.

Commercial fisheries and fish and shellfish ecology are linked receptors and the interaction effects associated with a change in the targeted species of commercial fisheries has been scoped out of the assessment within chapter 12: Commercial Fisheries as chapter 9: Fish and Shellfish Ecology determined that there would be no significant effects on fish and shellfish receptors as a result of construction, operation and decommissioning of the Project and as such no significant displacement or disruption to commercially important fish species is anticipated.

32.5.4 Marine mammals and megafauna

The potential impacts on marine mammals and megafauna receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 10: Marine Mammals and Megafauna. As identified in Table 32-1, interactive effects exist between marine mammals and megafauna receptors and the following:

- Fish and shellfish ecology – these are described above in section 32.5.3; and
- Shipping and navigation – an increase in vessel numbers has the potential to have direct effects on marine mammals through collision.
  - This effects of the Project on shipping and navigation and resulting direct effects on marine mammals and megafauna been fully assessed in:
    - Section 10.10.3: Injury and/or disturbance to marine megafauna from vessel and other construction activities (construction, operational and maintenance and decommissioning phases).

32.5.5 Offshore ornithology

The potential impacts on offshore ornithology receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 11: Offshore Ornithology. As identified in Table 32-1, interactive effects exist between offshore ornithology receptors and the following:

- Fish and shellfish ecology – these are described above in section 32.5.3; and
- Shipping and navigation – an increase in vessel numbers has the potential to have direct effects on ornithology from disturbance and displacement.
  - This effects of the Project on shipping and navigation and resulting direct effects on offshore ornithology has been fully assessed in:
    - Section 11.10.1: Disturbance and displacement (construction, operational and maintenance and decommissioning phases).

32.5.6 Commercial fisheries

The potential impacts on commercial fisheries during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 12: Commercial Fisheries. As identified in Table 32-1, interactive effects exist between commercial fisheries and the following:

- Fish and shellfish ecology – see section 32.5.3 for interactive effects with fish and shellfish ecology.

32.5.7 Shipping and navigation

The potential impacts on shipping and navigation during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 13: Shipping and Navigation. As identified in Table 32-1, interactive effects exist between shipping and navigation and the following:

- Marine mammals and megafauna – see section 32.5.4 for interactive effects with marine mammals and megafauna; and
- Offshore ornithology – see section 32.5.5 for interactive effects with offshore ornithology.

32.5.8 Aviation, military and communications

Aviation, military and communication receptors and infrastructure and other users receptors are linked receptors and therefore interaction effects are linked, however the impacts of this kind have been scoped out of the assessment (e.g. helicopter operations affecting the available air space for other users have been scoped out as helicopter access would be used in the event of an emergency only). The level of activity anticipated is very low and no regular users of the airspace over the offshore wind farm area have been identified.

32.5.9 Marine archaeology

The potential impacts on marine archaeology during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 15: Marine Archaeology. As identified in Table 32-1, interactive effects exist between marine archaeology and the following:

- Marine processes – see section 32.5.1 for interactive effects with marine processes.

32.5.10 Infrastructure, marine recreation and other users

The potential impacts on infrastructure, marine recreation and other users during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 16: Infrastructure, Marine Recreation and Other Users. As identified in Table 32-1, interactive effects exist between infrastructure, marine recreation and other users and the following:

- Marine processes – see section 32.5.1 for interactive effects with marine processes; and
- Aviation, military and communications – see section 32.5.8 for interactive effects with aviation, military and communications.

32.5.11 Climate

The potential impacts on climate during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 17: Climate.

Directive 2011/92/EU included climate as a criterion for assessment in EIA both in terms of the impact of the Project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the Project to climate change (e.g. such as through flood risk (see chapter 22: Hydrology and Flood Risk) or the risk of major accidents and/or hazards caused by climate change) (see chapter 24: Risks of Major Accidents and Natural Disasters).

Climate change will result in modified climate conditions and an increase in extreme weather events and the adaption of the Project to these impacts has been considered into the design of the Project (see chapter 5: Project Description). This adaption is also addressed within chapter 24: Risks of Major Accidents and Natural Disasters.

The assessment provided in chapter 17: Climate assesses the direct and indirect greenhouse gas emissions (GHG) for the Project. Overall, the Project will indirectly reduce GHG emissions and therefore has potential for positive impacts on climate, which indirectly will lead to positive effects on biodiversity and human health. As identified in Table 32-1, effects on climate also have the potential to have secondary interactive effects on the following receptors:

- Population and Human Health – The generating assets of the Project will be part of wider energy sector transition that reduces the severity of climate change. The benefits to population health will include reducing adverse physical and mental health effects of climate change for deprived populations, particularly in low- and middle-income countries globally. Also, during operation, the generating aspects of the Project will provide energy infrastructure that supports many aspects of public health. A reliable supply of electricity is required in relation to health-supportive factors including, population food safety, thermal comfort, healthcare, learning, income generation and social support.
  - The effects of the Project on climate and the resulting indirect effects on human health have been assessed in:

    - Section 18.10.2: Human health – Public health effects from climate change and adaptation (operational and maintenance phase); and
    - Section 18.10.2: Human health – Public health effects from wider societal infrastructure and resources (operational and maintenance phase).

- Biodiversity – an assessment of the benefits on ecological receptors is not provided in the topic chapters. However, it is widely recognised that climate change affects ecosystems on land and in water in many ways. The Intergovernmental Panel on Climate Change (IPCC) Synthesis Report of the IPCC Sixth Assessment Report (Ar6) (IPCC, 2023) summarises the state of knowledge of climate change, its widespread impacts and risks, and climate change mitigation and adaptation. It also recognises the interdependence of climate, ecosystems and biodiversity, and human societies.

As identified in Table 32-1, interactive effects also exist between climate and the following:

- Traffic and transport – see section 32.5.21 for interactive effects with climate; and
- Hydrology and flood risk – see section 32.5.16 for interactive effects with climate.

32.5.12 Population and human health

The potential impacts on population and human receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 18: Population and Human Health. As identified in Table 32-1, interactive effects exist between population and human receptors and the following:

- Traffic and transport – the generation of traffic has the potential to indirectly affect population and human health through traffic movements and disruption to the local road network including hindering access to houses. There is a potential for wider indirect impacts to sensitive non-road receptors (i.e. local national and post-primary schools) from temporary works and diversions on the road network during construction.
    - The effects of traffic movements on population and human health have been assessed in:
        - Section 18.10.1: Population – Changes to recreational, amenity and community facilities (construction, operational and maintenance and decommissioning phases); and
        - Section 18.10.3: Human health – Public health effects from changes to transport modes, access and connections – onshore (construction and decommissioning phases).
- Air quality – the generation of emissions largely occur because of fugitive dust arising from onshore construction activities such as traffic movements and excavations. Such emissions have the potential to impact on human health. However, air quality impacts are scoped out of the human health assessments due to them having, at most, a slight adverse significance with standard mitigation measures included as part of the Project. This issue would therefore not be expected to affect human health.
    - The effects of changes in air quality on population has been assessed in:
        - Section 18.10.1: Population – Changes to recreational, amenity and community facilities (construction, operational and maintenance and decommissioning phases).
- Climate – see section 32.5.11 for interactive effects with climate.
- Noise (airborne) and vibration – noise and vibration have the potential to cause nuisance and disturbance to nearby residential receptors during all phases of the Project as a result of construction activities and operation of the substation.
        - Section 18.10.1: Population – Changes to recreational, amenity and community facilities (construction, operational and maintenance and decommissioning phases).
    - The impact of changes in noise exposure on human health has been assessed in:
        - Section 18.10.2: Human health – Impact of noise and vibration on human health (construction, operational and maintenance and decommissioning phases).
- Seascape, landscape and visual amenity – landscape and visual impacts associated with all phases of the Project have the potential to impact on residential amenity and community facilities. In the construction phase such impacts will arise as a result of the presence of plant, personnel, and

construction activities. During the operational and maintenance phase, effects arise from the offshore wind farm area and onshore substation.

  - The effects of changes on landscape and seascape on population has been assessed in:
    - Section 18.10.1: Population – Changes to recreational, amenity and community facilities (construction, operational and maintenance and decommissioning phases).
  - The effects of changes on landscape and seascape on human health has been assessed in:
    - Section 18.10.2: Human health – Public health effects from changes to community identity, culture, resilience and influence (operational and maintenance phase). The visual impact of the Project is considered and the potential for the introduction of visual changes to influence community identify to an extent that could significantly affect population mental health and wellbeing. This includes negative associations with changes to visual impact (i.e. disruption of views) and positive associations (i.e. the Project representing societal adaptation to climate change or new job opportunities).

- Water - effects to public drinking water infrastructure is scoped out of the population and human health assessment on the basis that disruption of the existing water utilities network would be avoided.

32.5.13 Onshore biodiversity

The potential impacts on ecology receptors including intertidal birds during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 19: Onshore Biodiversity. As identified in Table 32-1, interactive effects exist between ecology receptors and the following:

- Noise (airborne) and vibration – impacts may lead to noise disturbances on Important Ecological Features (IEFs) sites for nature conservation, onshore birds, and intertidal birds during construction of the onshore cable and substation. The construction impact of disturbance from noise, vibration, lighting, and human presence during the construction phase has the potential to affect commuting, foraging, and breeding onshore birds.
  - The effects of noise and vibration on ecology receptors is assessed in:
    - Section 19.10.1: Disturbance from noise, vibration, lighting and human presence (construction and decommissioning phases).
- Hydrology – impacts may lead to surface run-off carrying suspended silt or contaminants into local watercourses.
  - The effects of impacts on water quality on ecology receptors is assessed in:
    - Section 19.10.3: Surface water run-off carrying suspended silt or contaminants into local watercourses (construction and decommissioning phases); and
- Soils, geology and hydrogeology – impacts that may lead to changes of groundwater quality, yield and/or flow paths associated with earthworks and impacts on ecological features during all phases have been scoped out of the assessment.

32.5.14 Land and agriculture

The potential impacts on agricultural receptors during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 20: Land and Agriculture. As identified in Table 32-1, interactive effects exist between agricultural receptors and the following:

- Traffic and transport – additional traffic on the local road network during the construction phase of the Project will potentially impact the local agricultural activities, particularly during harvest times when the road network will be used more frequently by agricultural vehicles. This effect may be further increased with the introduction of advisory traffic diversions in certain locations.
  - The effects of traffic and transport on agricultural receptors are assessed in:
    - Section 20.10.5: Impacts from increase in noise, dust and traffic resulting in impacts on agriculture (construction and decommissioning phases).

- Noise and vibration – impacts may lead to noise disturbances on some farm animals particularly those of a more sensitive nature such as horses during the construction phase.
  - The effects of impacts from noise and vibration on agricultural receptors are assessed in:
    - Section 20.10.5: Impacts from increase in noise, dust and traffic resulting in impacts on agriculture (construction and decommissioning phases).
- Air quality – impacts may lead to eye irritation for livestock from high levels of wind-blown dust particles during construction. Dust and other particulate matter deposited onto crops may also impact the quality of agricultural crops growing close to the construction activities.
  - The effects of impacts on air quality on agricultural receptors are assessed in:
    - Section 20.10.5: Impacts from increase in noise, dust and traffic resulting in impacts on agriculture (construction and decommissioning phases); and
- Soils, geology and hydrogeology – impacts may lead to land reinstatement following construction or decommissioning activities of land.
  - The effects of impacts on soils on agricultural receptors are assessed in:
    - Section 20.10.4: Damage to land requiring reinstatement (construction and decommissioning phases).

32.5.15 Soils, geology and hydrogeology

The potential impacts on soils, geology and hydrogeology birds during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 21: Soils, Geology and Hydrogeology. As identified in Table 32-1, interactive effects exist between ecology receptors and the following:

- Onshore biodiversity – see section 32.5.13 for interactive effects with onshore biodiversity; and
- Land and agriculture – see section 32.5.44 for interactive effects with land and agriculture.

32.5.16 Hydrology and flood risk

The effects on hydrology receptors and flood risk during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 22: Hydrology and Flood Risk. As identified in Table 32-1, interactive effects exist between flood risk and climate. A Flood Risk Assessment report (see appendix 22-1: Flood Risk Assessment) was prepared for the onshore substation site, which indicated that it is not prone to flooding and will not, in itself, increase the risk of flooding elsewhere. The assessment considered climate change when predicting the flood extents. It concluded minor increases in predicted flooding from the River Dee within the Hydrology and Flood Risk Study Area as a result of climate change and the increase does not encroach on the permanent footprint of the onshore substation site and is considered to be negligible.

- Onshore biodiversity – see section 32.5.13 for interactive effects with onshore biodiversity.

32.5.17 Air quality

The potential impacts on air quality during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 23: Air Quality. As identified in Table 32-1, interactive effects exist between air quality and the following:

- Traffic and transport - road traffic associated with the Project can impact directly on local air quality due to increased levels of emissions from additional vehicles on the road network during construction.
  - The impacts of traffic and transport on air quality have been assessed in:
    - Section 23.10.2: The increased vehicle emissions from traffic generation associated with the Project (construction and decommissioning phases).
- Population and human health – see section 32.5.12 for interactive effects with population and human health; and

- Land and agriculture – see section 32.5.14 for interactive effects with land and agriculture.

32.5.18 Noise (airborne) and vibration

The potential impacts from noise and vibration during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 25: Noise (Airborne) and Vibration. As identified in Table 32-1, interactive effects exist between noise and vibration and the following:

- Traffic and Transport – the generation of traffic during the construction phase of the Project has the potential to result in noise and vibration as a result of traffic increases on the local road network. However, the effect of construction traffic on noise and vibration has been scoped out of the assessment due to the predicted increase in traffic flows due to construction traffic on the receiving road network being well below 25%, implying a negligible noise level increase of less than 1dB.
- Population and human health – see section 32.5.12 for interactive effects with population and human health.
- Onshore biodiversity – see section 32.5.13 for interactive effects with onshore biodiversity; and
- Land and Agriculture – see section 32.5.14 for interactive effects with land and agriculture.

The effects of subsea noise on fish and shellfish (chapter 9) and marine mammals and megafauna (chapter 10) are assessed in the topic chapters.

32.5.19 Cultural heritage

The potential impacts on cultural heritage during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 26: Cultural Heritage. As identified in Table 32-1, interactive effects exist between cultural heritage and the following:

- Seascape, landscape and visual amenity – the Project has the potential to cause visual impacts on archaeological and cultural heritage features due to a change in the character of the receiving historic environment (e.g. interrupting the view of historic features from external public spaces).
  - The impacts of landscape and visual effects of the Project on cultural heritage are assessed in:
    - Section 26.10.4: Effects of the offshore wind farm on setting

32.5.20 Seascape, landscape and visual amenity

The potential impacts on landscape and seascape during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 27: Seascape, Landscape and Visual Amenity. As identified in Table 32-1, interactive effects exist between cultural heritage and the following:

- Population and human health – see section 32.5.12 for interactive effects with population and human health; and
- Cultural heritage – see section 32.5.19 for interactive effects with cultural heritage.

32.5.21 Traffic and transport

The potential impacts on traffic and transport during construction, operational and maintenance and decommissioning phases of the Project have been assessed in chapter 28: Traffic and Transport. As identified in Table 32-1, interactive effects exist between cultural heritage and the following:

- Climate – see section 32.5.11 for interactive effects with climate;
- Population and human health – see section 32.5.12 for interactive effects with population and human health;
- Land and agriculture – see section 32.5.14 for interactive effects with land and agriculture;
- Air quality – see section 32.5.17 for interactive effects with air quality; and

- Noise (airborne) and vibration – see section 32.5.18 for interactive effects with noise and vibration.

32.5.22 Material assets

No other factors interact with material assets in the assessment of the Project.

32.5.23 Resource and waste management

No other factors interact with waste in the assessment of the Project.

32.5.24 Bats in the marine environment

No other factors interact with bats in the marine environment in the assessment of the Project.

32.6 Potential interactive effects across all phases of the Project on receptors

In chapters 7-16 (volume 2B) and chapters 17-31 (volume 2C (excluding chapter 24: Risks of Major Accidents and Natural Disasters) of the EIAR a summary table is presented which provides details on the potential environmental effects and measures to mitigate effects and monitoring where recommended. The summary tables provide an overview of the phases where effects will occur including the above identified interactive effects over the three phases of the Project. Measures are proposed to minimise effects as relevant.

On the basis that the residual impacts are not significant during the construction phase and taking into account the short-term nature of the construction phase, it is considered that receptors will not be subject to combined significant effects from the interaction between effects outlined above with the implementation of measures.

On the basis that the majority of residual impacts are not significant it is considered that receptors will not be subject to combined significant effects from interaction between effects during the operational phase with the implementation of measures. It is noted that significant visual effects are predicted to occur at 3 of the 18 viewpoints assessed, however it is considered that these will not result in any greater significance when combined with other interactive effects.

References

Environmental Protection Agency, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports.

European Commission, 1999. Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

Intergovernmental Panel on Climate Change (IPCC), 2023. Synthesis Report of the IPCC Sixth Assessment Report (AR6).