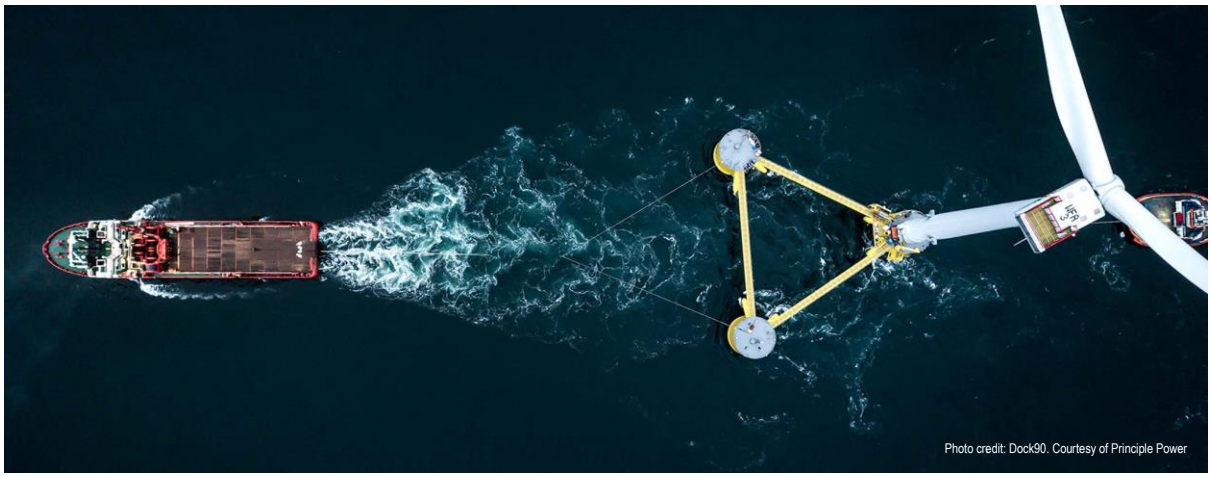

Project Erebus Environmental Statement
Chapter 29: Inter-related Effects

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Acronyms

Term	Definition
AEZ	Archaeological Exclusion Zone
BGW	Blue Gem Wind
EIA	Environmental Impact Assessment
EMFs	Electric Magnetic Frequencies
ES	Environmental Statement
FLOW	Floating Offshore Wind
HRA	Habitats Regulations Assessment
INNS	Invasive Non-Native Species
IPC	Infrastructure Planning
MCAA	Marine Coastal Access Act
MPCP	Marine Pollution Contingency Plan
NPS	National Policy Statements
NRW	Natural Resource Wales
NSIP	Nationally Significant Infrastructure Projects
O&M	Operation and Maintenance
PCNP	Pembrokeshire Coast National Park
PDE	Project Design Envelope
PINS	Planning Inspectorate
PTS	Permeant Threshold Shift
SCA	Seascape Character Area
SLVIA	Seascape and Landscape Visual Impact Assessment
SSC	Suspect Sediment Concentration
TAEZ	Temporary Archaeological Exclusion Zone
UXO	Unexploded Ordinance
VER	Valued Ecological Receptor
WFD	Water Framework Directive
WTG	Wind Turbine Generators

Chapter 29 Inter-related Effects

29.1 Introduction

29.1.1.1 The study area for the assessment of inter-related effects has been informed by the study areas used in the topic-specific assessments. Due to the differing spatial extent of effects experienced by different offshore and onshore receptors, the study area for potential inter-related effects varies according to topic and receptor. The potential inter-related effects considered in this chapter are, therefore, limited to the study areas defined in each of the topic specific chapters.

29.1.1.2 This chapter utilises and builds upon the information presented in the Environmental Impact Assessment (EIA) Scoping Report submitted to Natural Resources Wales (NRW) in October 2019. Comments with respect to inter-related effects included in NRW's formal Scoping Response, have been addressed within this chapter (NRW, 2020).

29.1.1.3 Chapters 6 to 28 of Volume 1 of this Environmental Statement (ES) assess the effects of the offshore and onshore elements of the Project on topic-specific receptors. The assessments are impact-led (i.e. the impacts on receptors are identified by impact type for the construction, operation and maintenance (O&M), and decommissioning phases).This inter-related effects chapter adopts a different approach, by focusing on the receptor and then identifying the impacts which may arise from more than one environmental topic, or impacts that may arise during more than one project phase (i.e. impacts which are not explicitly addressed elsewhere in the Environmental Statement).

29.1.1.4 In particular, this ES chapter:

- Presents the receptor groups considered within the EIA process;
- Summarises the potential for effects on these receptor groups, based on the findings of the topic- specific chapters (Volume 1, Chapters 6 to 28), across the three key project phases (construction, O&M, and decommissioning); and
- Presents the potential for multiple effects on any of the identified receptor groups to interact and create 'inter-related' effects.

29.1.1.5 The impact assessment presented within this chapter draws upon the information, assessment and conclusions presented in Volume 1, Chapters 6 to 28.

29.1.1.6 This chapter only assesses inter-related effects between topic chapters on offshore and onshore receptors. Cumulative effects (i.e. effects arising from other developments acting together with the Project) are addressed in the individual topic chapters of the ES and in Chapter 30 Cumulative Effects Assessment.

29.1.1.7 The potential inter-related effects have been assessed conservatively, using realistic worst-case scenarios for the Project. The Project Design Envelope (PDE) is provided in full in Chapter 4: Proposed Development Description.

29.1.1.8 This assessment has been undertaken by MarineSpace Ltd and ITP Energised. The chapter has been authored by Emanuele Stella who has over fifteen years' experience in EIA and Damien Kirby who has over seven years' experience as a marine consultant. He was previously employed at Cefas, during which time he provided advice to UK regulatory bodies on technical reports submitted as part of EIA, Habitats Regulations Assessment (HRA) or Water Framework Directive (WFD) assessments.

29.2 Legislation, Policy and Guidelines

29.2.1.1 The Project is seeking a Section 36 consent with deemed planning permission under the Electricity Act 1989 from Welsh Ministers, administered by the Planning Inspectorate (PINS), and a Marine Licence under the Marine and Coastal Access Act 2009 (MCAA) issued by NRW.

29.2.1.2 A detailed overview of the relevant policy and legislation for the Project is provided in Chapter 5: Policy and Legislation. Details of relevant legislation, policy, and guidelines that have been taken into consideration during this assessment are outlined below.

29.2.2 National Policy Statements

29.2.2.1 Even though the NPSs listed above specifically relate to Nationally Significant Infrastructure Projects (NSIP), and the Project is not classified as a NSIP, a review of National Policy Statements (NPS) EN-1 and NPS EN-3 has still been undertaken. Details of specific policies within EN-1 used to inform this assessment are provided in Table 29.1.

Table 29.1 – National Policy Statement EN-1 Assessment Provisions Relevant to Inter-related Effects

NPS Requirement	NPS Reference	ES Reference
The Infrastructure Planning Commission (IPC) should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy and community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place.	4.2.6	Topic-specific chapters have been prepared for the offshore and onshore elements of the Project in Chapters 1 to 28. The assessment of inter-related effects is presented in section 11.7 of this chapter

29.2.3 Guidance

29.2.3.1 The inter-related effects assessment presented in this chapter has been completed in accordance with the following guidance from PINS Advice Note 9 (PINS, 2018):

- *"Ensure that the assessment of the worst case scenario(s) address impacts which may not be significant on their own but could become significant when they inter-relate with other impacts alone or cumulatively with impacts from other development (including those identified in other aspect assessments)."*

29.3 Offshore Assessment Methodology and Significance Criteria

29.3.1 Study Area

29.3.1.1 Each assessment chapter within the ES stipulates the topic specific study area, relevant to the respective receptor group. The spatial extent of these study areas is not consistent and varies in accordance with the topic and receptor. The determinations within these chapters are used to inform the inter-related effects assessment and, as such, assessment within the present Chapter is limited to the study areas as detailed in each topic-specific chapter.

29.3.2 Desk Study

29.3.2.1 The baseline environments for the each of the receptor groups considered in the inter-related effects assessment vary in accordance with the specific topic area. In accordance with this, these are defined within the relevant chapters.

29.3.3 Assessment Methodology

29.3.3.1 The approach to assessing inter-related effects within this chapter has followed a four-stage process, as summarised in Table 29.2 and outlined in the following paragraphs.

Table 29.2 Summary of staged approach to the inter-related effects assessment for the Project.

Stage	Description
1	Assessments undertaken for individual EIA topic areas within Chapters 6 to 18.
2	Review of the assessments set out within Chapters 6 to 18 to identify any receptor groups that may be affected by more than one topic area.
3	Identification of potential inter-related (offshore) effects on these receptor groups, including consideration of the extent to which potential inter-related effects are already considered within the Environmental Statement.
4	Assessment of how individual effects may combine to create inter-related effects on each receptor group for: 'project lifetime effects' (i.e. during construction, O&M, and decommissioning phases); and 'receptor-led effects' (i.e. multiple effects on a single receptor).

29.3.4 Stage 1: Topic-specific assessments

29.3.4.1 The first stage of the assessment of inter-related (offshore) effects is presented in each of the individual offshore topic chapters and comprises the individual assessments of effects on receptors across the construction, O&M, and decommissioning phases of the onshore elements of the Project.

29.3.4.2 The findings of these assessments are presented in Chapters 6 to 18 of the ES.

29.3.5 Stage 2: Identification of receptor groups

29.3.5.1 Stage 2 involves a review of the assessments undertaken in the topic-specific chapters to identify 'receptor groups' requiring assessment within the inter-related effects assessment. The term 'receptor group' is used to highlight that the approach taken for the inter-related effects assessment does not assess every individual receptor assessed at the EIA stage but, rather, potentially sensitive groups of receptors. The receptor groups assessed can be broadly categorised as follows:

29.3.5.2 Physical environment:

- Marine and coastal processes;
- Marine sediment and water quality;

29.3.5.3 Biological environment:

- Offshore designated sites;
- Marine and coastal ecology;
- Fish and shellfish ecology;
- Marine ornithology;
- Marine mammals and reptiles;

29.3.5.4 Human environment:

- Seascape and visual impact;
- Marine archaeology and cultural heritage;
- Commercial fisheries;
- Shipping and navigation;
- Aviation and radar;
- Coastal and marine infrastructure and other users.

29.3.5.5 The potential for inter-related effects is considered in further detail at Stage 3.

29.3.6 Stage 3: Identification of potential inter-related effects on receptor groups

29.3.6.1 Consideration is given to the potential for inter-related effects to arise for each of the identified receptor groups across the three project phases (i.e. project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in Table 29.3.

Table 29.3 Definitions of project lifetime and receptor led inter-related effects.

Effect Type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the project, (construction, O&M, and decommissioning) to interact to potentially create a more significant effect on a receptor, than if just assessed in isolation in these three key project stages (e.g. construction phase, operational phase and decommissioning).

Effect Type	Definition
Receptor-led effects	Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, all effects on a given receptor such as benthic habitats - sediment deposition, habitat loss/disturbance from jacking-up/anchor placement/scour, cable installation/burial, changes in physical processes etc., may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

29.3.7 Stage 4: Assessment of inter-related effects on each receptor group

29.3.7.1 Individual effects on each of the receptor groups identified above have been considered. It is important to note that the inter-related effects assessment considers only effects produced by the offshore elements of the Project and not from other projects, which are considered within the Chapter 30: Cumulative Effects Assessment.

29.3.7.2 The significance of the individual effects, as defined in the topic-specific chapters, is presented in the assessment tables for each receptor group (all conclusions for significance of effect assume successful implementation of mitigation measures where appropriate, i.e. the residual effect has been used). A descriptive assessment of the scope for these individual effects to interact to create a different or greater effect has then been undertaken. This assessment incorporates qualitative and, where reasonably possible, quantitative assessments. The assignment of significance of effect for any such inter-related effect is not undertaken; rather, any inter-related effects that may be of greater significance than the individual effects acting in isolation on a given receptor are identified and discussed within these inter-related effects chapter.

29.4 Assessment of Inter-related effects

29.4.1 Offshore Physical Environment

Marine Processes

29.4.1.1 The different marine and coastal processes considered in Chapter 6: Marine Coastal Processes are already inter-related; in particular, sediment transport is dependent on currents and waves and therefore these linked processes have already been considered within the assessment. In turn, this information on changes to marine and coastal processes, has been used to inform other EIA topics such as:

- Chapter 7: Marine Seabed and Water Quality;
- Chapter 8: Offshore Designated Sites;
- Chapter 9: Marine and Coastal Ecology;
- Chapter 10: Fish & Shellfish Ecology;
- Chapter 11: Offshore Ornithology; and
- Chapter 12: Marine Mammals.

29.4.1.2 Assessments have been undertaken separately within these individual topic Chapters and are not reported here as additional inter-relationships.

29.4.1.3 A small number of features have been identified in Chapter 6: Marine Coastal Processes as potentially sensitive marine processes receptors. The only receptor groups identified with the potential for inter-related effects are seabed morphology (inclusive of offshore sandbank features) and the adjacent coastlines.

29.4.1.4 Assessment of interrelated effects has considered the following impact pathways:

- Potential changes to the morphology of the seabed including from scour; and
- Potential changes in morphology of the coast.

29.4.1.5 The potential for interrelated effects to arise from these pathways is set out in Table 29.4. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases. Assessment within Chapter 6: Marine Coastal Processes has already taken account of potential for inter-related effects. Although assessment of both impact pathways, e.g. potential changes to sediment transport system by changes in wave and current climate; and receptors, e.g. potential changes to the morphology of the seabed (including scour), has been considered separately, assessment of impact significance is only presented for receptors. As such, receptor-led inter-related effects that affect seabed morphology and/or adjacent coastlines are fully considered within the topic-specific chapter.

Table 29.4 Summary of the potential project lifetime inter-related effects

Marine Processes					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Potential changes to the morphology of the seabed including from scour.		Minor adverse	Minor adverse	Minor adverse	The presence of both anchoring structures and cable protection measures have the potential to impact seabed morphology. This impact will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. However, assessment of morphological change during O&M phase within Chapter 6: Marine Coastal Processes makes full assessment of the incremental increase towards the operational scenario. Effects arising from the presence of these structures across all phases will be no greater than that identified for the operational phase.
Potential changes in morphology of the coast.		Minor adverse	Minor adverse	Minor adverse	The magnitude of impact from all Project phases activities is predicted to be (no greater than) minor. Most effects will only be present whilst respective works are being completed. Indirect impacts of longer-term duration (e.g. changes related to modification of the hydrodynamic/wave regime) will be highly localised. In view of the highly localised spatial scale and minor magnitude of effects across project phases it is considered there is minimal potential for interaction, and inter-related effects will be no greater than the worst-case scenarios assessed within Chapter 6: Marine Coastal Processes.

29.4.2 Biological Environment

Marine and Coastal Ecology

29.4.2.1 Effects on marine and coastal ecology may also lead to secondary effects on other receptors, which are fully considered in the topic-specific chapters. These areas of interaction are listed below:

- Temporary habitat disturbances and loss. This is assessed within Chapter 9: Marine and Coastal Ecology, Chapter 10: Marine Ornithology (indirect effects on ecology) and Chapter 12: Marine Mammals (indirect effects on ecology);
- Increased suspended sediment (and smothering). This is assessed within Chapter 9: Marine and Coastal Ecology and in Chapter 6: Marine Coastal Processes, Chapter 7: Marine Sediment and Water Quality and Chapter 10: Marine Ornithology;
- Protection of benthic habitats from fishing restrictions. This is assessed within Chapter 9: Marine and Coastal Ecology and, in part, in Chapter 10: Marine Ornithology (for reduced fishing pressures) and Chapter 15: Commercial Fisheries (for loss of access to grounds);
- Accidental release of pollutants. This is assessed within Chapter 9: Marine and Coastal Ecology and in Chapter 7: Marine Sediment and Water Quality;
- Accidental release of contaminants from disturbance of sediments. This is assessed within Chapter 9: Marine and Coastal Ecology and in Chapter 7: Marine Sediment and Water Quality;
- Permanent loss of habitat via project infrastructure. This is assessed within Chapter 9: Marine and Coastal Ecology and in Chapter 10: Marine Ornithology (indirect effects on ecology); and
- Effects of Electromagnetic Fields from electrical cables. This is assessed within Chapter 9: Marine and Coastal Ecology and in Chapter 10: Marine Ornithology (indirect effects on ecology).

29.4.2.2 The worst-case impacts assessed within Chapter 9: Marine and Coastal Ecology take interactions between project effects from different phases into account. Therefore the impact assessments presented therein are considered conservative and robust.

29.4.2.3 The potential for interrelated effects to arise from these pathways is set out in Table 29.5. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect benthic habitats or benthic ecological communities.

Table 29.5 Summary of the potential project lifetime inter-related effects

Benthic Ecology					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 months**	**≤25 years**	**8 months**	
Temporary habitat disturbances and loss		Minor adverse	Minor adverse	Minor adverse	Impact of temporary habitat disturbances and loss during all Project phases individually was determined to be of negligible to low magnitude and occur in areas of low or medium sensitivity. The cumulative extent of habitat loss/disturbance across all Project phases will be larger than the extent assessed in any one individual phase (e.g. construction). However, the footprint of O&M and decommissioning activities will be contained within the footprint of construction activities. As such, consideration of multiple Project phases will not result in an impact of greater extent than that assessed for construction. Individual activities that cause temporary habitat loss/disturbance will not occur continuously and only a small proportion of the total benthic habitat will be impacted at any one time. Given the high level of spatial overlap and the expected degree of recoverability in benthic communities it is expected that Project lifetime effects will not result in combined effects of greater significance than the assessments for each individual phase.

Benthic Ecology					
Increased suspended sediment (and smothering).		Minor adverse	Minor adverse	Minor adverse	Effects of seabed disturbance from elevated Suspended Sediment Concentration (SSC)/smothering will primarily occur during the construction and decommissioning phases. All effects are expected to be of short duration and each Valued Ecological Receptor (VER) within the assessment was determined to be of low or medium sensitivity. Due to the limited sensitivity of the benthic communities in this area, the cumulative effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for the individual project phases.
Protection of benthic habitats from fishing restrictions		Minor beneficial	Minor beneficial	Minor beneficial	The cumulative effect of protection of benthic habitats from fishing across all project phases will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Consideration of multiple Project phases would not be associated with an increase of spatial extent, as effects will be limited to the array area in all cases; therefore the magnitude of change will not change. Given the relatively small increase in duration for all Project phases relative to the operational phase alone, the combined effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for operational phase individually.
Accidental release of pollutants.		Minor adverse	Minor adverse	Minor adverse	The risk of pollution events is considered to be low, and if these do occur, it is expected that they would be rare. Various mitigation measures will be employed, at all times, to prevent pollution events and stipulate the emergency response procedure to follow, should one occur. These will be set out in

Benthic Ecology					
					a Marine Pollution Contingency Plan (MPCP) to be produced and agreed with stakeholders post consent. In addition, the strong hydrodynamic regimes across the Study Area, mean that should an accidental release occur, the substance should rapidly disperse, and thus minimise its potential for sustained impact on the benthic environment. It is expected that if pollution events do occur these will be rare, and the level of mitigation put in place will be sufficient to minimise adverse effects on benthic ecological receptors. In view of this, it is considered that Project lifetime interactions will not result in in combined effects of greater significance than the assessments for each individual phase.
Permanent loss of habitat via project infrastructure		Minor adverse	Minor adverse	Minor adverse	The effects from the presence of project infrastructure will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on benthic ecology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Effects of EMF emissions from electrical cables		n/a	Minor adverse	n/a	Cable EMFs will only be produced at the time of energy transmission. As such, this will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.

Benthic Ecology					
Introduction of invasive and non-native species (INNS)		Minor adverse	Minor adverse	Minor adverse	Increased vessel activity during all Project phases will be associated with a potential increased risk of introduction of INNS into the area, and there is the risk of colonisation by INNS on the installed marine infrastructure that provides suitable artificial habitat for settlement. Project embedded standard mitigation measures include the development of an INNS Plan that will provide a framework for management of biosecurity issues and invasive species for the Project duration and will include compliance with relevant guidance regarding ballast water; these measures will reduce the overall risk of introduction. Within Chapter 9: Marine and Coastal Ecology it is determined that the negligible to low magnitude of the effect, combined with the medium sensitivity of the receptor will result in impact of minor significant for each individual Project phase. Although assessment of Project lifetime effects may lead to a small increase in INNS risk, this is still likely to remain of low magnitude. Given that receptor sensitivity is unchanged over this increased temporal extent, combined effects over the project lifetime will not increase to be of greater significance than the assessments for each individual phase.
Alteration of seabed habitats from effects on physical processes, including scour effects and changes in wave and tidal regime		Minor adverse	Minor adverse	n/a	The effects from the presence of project infrastructure will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years).

Benthic Ecology					
					Across the project lifetime, the effects on benthic ecology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Receptor-based Effects					
There is potential for interactions between the effects of habitat loss/disturbance/alteration, and effects on benthic habitats from sediment deposition associated with elevated SSC. It is considered that there is greatest risk of inter-related impacts from the combined effects of direct (both temporary and permanent/long-term) habitat loss/disturbance which results from jacking-up/anchor placement/scour, indirect habitat disturbance from cable installation/burial and due to sediment deposition, and indirect effects of changes in physical processes due to the presence of Project infrastructure within the marine environment. Each of these potential impacts was assigned an individual significance of minor adverse. Although there is potential for effects to be amplified in areas where there is spatial and temporal overlap, it is expected that there will be a degree of spatial and temporal separation and, therefore, the combined effects will not be any more significant than the individual worst-case effects considered in isolation. Any disturbance is expected to be limited, and the benthic VERs seen within the baseline environment are widespread within the locality. Where temporary disturbance occurs, full recovery is predicted. In addition, any effects due to changes in physical processes are likely to be spatially limited and of small magnitude. Sensitivity of benthic receptors to these changes is determined to be low or medium. As such, these interactions are predicted to be no greater than the individual effects assessed in isolation.					

Fish and Shellfish

29.4.2.4 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on fish and shellfish and *vice versa*.

29.4.2.5 The worst-case impacts assessed within Chapter 10: Fish and Shellfish Ecology take these interactions into account and, therefore, the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts, and will be included within the inter-related assessment:

- Temporary habitat disturbances and/or damage. This is assessed within Chapter 10: Fish and Shellfish Ecology, in Chapter 9: Marine and Coastal Ecology, Chapter 11 Marine Ornithology and in Chapter 12: Marine Mammals;
- Increased suspended sediment and sediment deposition. This is assessed within Chapter 10: Fish and Shellfish Ecology, in Chapter 9: Marine and Coastal Ecology and in Chapter 12: Marine Mammals;
- Disturbance, injury and mortality from subsea noise. This is assessed within Chapter 10: Fish and Shellfish Ecology, in Chapter 9: Marine and Coastal Ecology and in Chapter 12: Marine Mammals;
- Permanent loss of habitat via project infrastructure. This is assessed within Chapter 10: Fish and Shellfish Ecology in Chapter 9: Marine and Coastal Ecology and in Chapter 12: Marine Mammals;
- Reduced fishing pressures within the Project area. This is assessed within Chapter 10: Fish and Shellfish Ecology and in Chapter 16: Shipping and Navigation; and
- EMF effects from cables. This is assessed within Chapter 10: Fish and Shellfish Ecology, in Chapter 9: Marine and Coastal Ecology and in Chapter 12: Marine Mammals.

29.4.2.6 The potential for interrelated effects to arise from these pathways is set out in Table 29.6. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect fish or shellfish receptors.

Table 29.6 Summary of the potential project lifetime inter-related effects

Fish and Shellfish					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Temporary habitat disturbances and/or damage		Minor adverse	Minor adverse	Minor adverse	Impact of temporary habitat disturbances and loss during all Project phases individually, was determined to be of low magnitude and occur in areas of low or medium sensitivity. The cumulative extent of habitat loss/disturbance across all Project phases will be larger than the extent assessed in any one individual phase (e.g. construction). However, the footprint of O&M and decommissioning activities will be contained within the footprint of construction activities. As such, consideration of multiple Project phases will not result in an impact of greater extent than that assessed for construction. Individual activities that may affect fish or shellfish receptors though temporary benthic habitat loss/disturbance will not occur continuously, and only a small proportion of the total benthic habitat will be impacted at any one time. Given the high level of spatial overlap, the expected degree of recoverability in benthic communities, and extent of alternative similar habitat available in the region, it is expected that Project Lifetime effects will not result in combined effects of greater significance than the assessments for each individual phase.
Increased suspended sediment and		Negligible	Negligible (fish adult life); Minor	Negligible (fish adult life); Minor	Effects of seabed disturbance from elevated SSC/smothering will primarily occur during the construction and decommissioning phases. All effects are expected to be of short duration and each fish and

Fish and Shellfish					
sediment deposition			adverse (fish eggs/larvae)	adverse (fish eggs/larvae)	shellfish receptor assessed within Chapter 10: Fish and Shellfish Ecology was determined to be of negligible (adult fish) or medium (shellfish or fish egg or larval stages) sensitivity. The majority of activities expected to cause elevated SSC will occur during the construction and decommissioning phases. It is expected that more sensitive shellfish or fish egg/larvae receptors, potentially affected by these changes, will have recovered in the intervening period between the construction and decommissioning phases. Due to the temporal separation between periods where SSC uplift is greatest, and the capacity for recovery in sensitive receptors, the cumulative effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for the individual project phases.
Disturbance, injury and mortality from subsea noise		Minor adverse	Negligible	Minor adverse	Impact of disturbance, injury and mortality from subsea noise during all Project phases individually was determined to be of minor to negligible significance. Sound levels will only exceed permeant threshold shift (PTS) or injury values for fish during the construction phase. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on fish and shellfish receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Permanent loss of habitat via project infrastructure		n/a	Minor adverse	n/a	The effects from the presence of project infrastructure will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a

Fish and Shellfish					
					relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on fish and shellfish receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Reduced fishing pressures within the Project area		n/a	Minor beneficial	n/a	The cumulative effect of protection of benthic habitats from fishing across all project phases will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Consideration of multiple Project phases would not be associated with an increase in terms of spatial extent, as effects will be limited to the array area in all cases; therefore the magnitude of change will not change. Given the relatively small increase in duration for all Project phases relative to the operational phase alone, the combined effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for operational phase individually.
EMF effects from cables		n/a	Minor adverse	n/a	Cable EMFs will only be produced at the time of energy transmission. As such, this will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Receptor-based Effects					
There is potential for interactions between effects of habitat loss/disturbance/alteration, effects on from sediment deposition associated with elevated SSC, accidental release of chemical contaminants, underwater noise and effects of EMF associated with presence of electrical cables within the marine environment. It is considered that there is greatest risk of inter-related impacts from the combined effects of direct or temporary habitat loss/disturbance, increased SSC, underwater noise from Unexploded Ordinance (UXO) clearance or drilling during the construction phase, and EMF effects during the operational phase.					

Fish and Shellfish
Each of these potential impacts was assigned an individual significance of minor adverse. However, some of the impacts outlined are mutually exclusive. For example, the effects of EMF associated with presence of electrical cables will be highly localised around the cable footprint, and there would be high, or complete spatial crossover between this extent and any effects from temporary/long term habitat loss/disturbance from cable installation/maintenance. Similarly, underwater noise is expected to result in displacement of mobile fish, which in turn will prevent these individuals from being exposed to the greatest increases in SSC. Overall, it is predicted that no inter-related effects will occur of greater significance than the individual effects assessed in isolation.

Offshore Ornithology

29.4.2.7 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on offshore ornithology and *vice versa*.

29.4.2.8 The worst-case impacts assessed within Chapter 11: Offshore Ornithology take these interactions into account and, therefore, the impact assessments are considered conservative and robust. For clarity, the areas of interaction between impacts are listed below:

- Indirect impacts as a result of displacement of prey due to construction activities. This has been assessed within Chapter 11: Offshore Ornithology, with the impacts on prey being discussed in Chapter 9: Marine and Coastal Ecology, and Chapter 10: Fish and Shellfish Ecology;
- Disturbance and displacement from underwater noise via construction activities (including piling and UXO), and disturbance to foraging birds from underwater noise and vibration via operation activities. This has been assessed within Chapter 11: Offshore Ornithology and discussed in Chapter 9: Marine and Coastal Ecology, and Chapter 10: Fish and Shellfish Ecology;
- Disturbance and displacement from vessels has been considered within Chapter 11: Offshore Ornithology;
- Displacement from the Project during the Operations phase has been discussed in Chapter 11: Offshore Ornithology;
- Collision effects have been discussed in Chapter 11: Offshore Ornithology;
- Barrier effects are discussed in Chapter 11: Offshore Ornithology;
- Indirect impacts through effects on habitats and prey species are discussed in Chapter 11: Offshore Ornithology;
- Attraction of nocturnal seabirds to lighting on project infrastructure are discussed in Chapter 11: Offshore Ornithology;

29.4.2.9 The potential for interrelated effects to arise from these pathways is set out in Table 29.7. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter related effects that affect fish or shellfish receptors.

Table 29.7 Summary of the potential project lifetime inter-related effects

Offshore Ornithology					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Indirect impacts as a result of displacement of prey		Negligible	n/a	Negligible	The combined effect across Project phases of collision with vessels will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 month) relative to the operational phase (up to 25 years). The effects on offshore ornithology receptors are not anticipated to be sufficiently different between those of the construction and decommissioning phase, as to result in combined effects of greater significance. The impact of inter relationships between receptors and indirect impacts as a result of displacement has been assessed as a negligible significance.
Disturbance and displacement from increased vessel activity (array and ECC)		Negligible to Minor Adverse	Negligible to Minor Adverse	Negligible to Minor Adverse	The combined effect across Project phases of Disturbance and displacement from increased vessel activity will be of greater duration than for each phase considered individually. Vessel activity will be highest during the construction and decommissioning phase However, both the construction and decommissioning phases

Offshore Ornithology					
					last for a relatively short time (8 month) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Disturbance and displacement from underwater noise		Minor Adverse	Negligible	Minor Adverse	Impact of disturbance from subsea underwater during all Project phases individually was determined to be of negligible to minor adverse significance. Sound levels will highest during the construction phase. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Collision risk		n/a	Negligible to Minor Adverse	n/a	Collision risk arising from offshore wind turbines will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Displacement		n/a	Negligible to Minor Adverse	n/a	Displacement arising from offshore wind turbines will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Barrier effect of wind turbine generators to		n/a	Minor Adverse	n/a	Barrier effect of wind turbine generators to regular movements of birds to and from

Offshore Ornithology					
regular movements of birds to and from breeding colonies or on migration					breeding colonies or on migration will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Indirect impacts through effects on habitats and prey species		n/a	Negligible	n/a	Indirect impacts through effects on habitats and prey species will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Aggregating effects of turbine structures		n/a	Minor Adverse	n/a	Aggregating effects of turbine structures will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Entanglement risk from ghost fishing gear		n/a	Minor Adverse	n/a	There is the potential risk of indirect entanglement to all diving bird species if ghost/derelict fishing gear and other marine

Offshore Ornithology					
					litter becomes attached to the sub-sea structures of the Project. Entanglement risk from ghost fishing gear will be limited to the O&M phase, and there is no potential for Project lifetime inter-related effects.
Attraction of nocturnal seabirds to lighting on project infrastructure		n/a	Minor Adverse	n/a	Indirect impacts through attraction of nocturnal seabirds to lighting on project infrastructure will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Receptor-based Effects					
There is potential for interactions between effects of multiple impact pathways. Each of the above impacts have been assigned an individual significance of negligible to minor adverse. However, some of the impacts outlined are mutually exclusive. For example, disturbance and displacement from underwater noise, increased vessel activity and displacement from the OWF development is expected to result in some displacement of Ornithology receptors, which in turn will reduce the risk of collision and eentanglement from ghost fishing gear. Overall, it is predicted that no inter-related effects will occur of greater significance than the individual effects assessed in isolation.					

Marine Mammals

29.4.2.10 The assessment of impacts arising from construction, O&M and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on marine mammals and vice versa.

29.4.2.11 The worst-case impacts assessed within Chapter 12: Marine Mammals take these interactions into account and, therefore, the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts pathways, and will be included within the inter-related assessment:

- Collision with vessels (Chapter 12: Marine Mammals)
- Disturbance from vessels (Chapter 12: Marine Mammals)
- Disturbance at seal haul outs (Chapter 12: Marine Mammals)
- Indirect impacts on prey (Chapter 12 Marine Mammals, Chapter 10: Fish and Shellfish Ecology and Chapter 15: Commercial Fisheries)
- Entanglement in sub-sea structures (Chapter 12 Marine Mammals)

29.4.2.12 The potential for interrelated effects to arise from these pathways is set out in Table 29.8. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect marine mammals.

Table 29.8 Summary of the potential project lifetime inter-related effects

Marine Mammals					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Collision with vessels		Minor adverse	Minor adverse	Minor adverse	The combined effect across Project phases of collision with vessels will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 month) relative to the operational phase (up to 25 years). It is not expected that the level of vessel activity during all phases individually would cause and increase in the risk of mortality from collisions. All marine mammal receptors are deemed to be of low vulnerability given that vessel collision is not considered to be a key source of mortality. Across the project lifetime, the effects on marine mammal receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance. The impact of inter relationships between receptors and vessel collision has been assessed as a minor (adverse) significance.
Disturbance from vessels		Minor adverse (cetaceans) Negligible (grey seals)	Minor adverse (cetaceans) Negligible (grey seals)	Minor adverse (cetaceans) Negligible (grey seals)	The combined effect from vessel disturbance across Project phases will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 month) relative to the operational phase (up to 25 years).

Marine Mammals					
					Heinänen and Skov (2015) suggested that harbour porpoise density was significantly lower in areas with vessel transit rates of greater than 80 per day (within a 5 km² area). It is not anticipated that vessel traffic in the Project area will exceed this figure during all Project phases. Given the relatively small increase in duration for all Project phases relative to the operational phase alone, the combined effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for operational phase individually. The impact of vessel disturbance has been assessed as minor (adverse) to negligible significance.
Disturbance at seal haul outs		Negligible	Negligible	Negligible	The Project lifetime effect of disturbance at seal haul outs will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 month) relative to the operational phase (up to 25 years). There is the potential for vessels moving between port and the array area to cause disturbance to grey seal haul-outs, however, it is not expected that any vessels would pass close enough to the haul-out or be travelling at sufficient speed to result in any disturbance throughout construction, O&M or decommissioning. Given the relatively small increase in duration for all Project phases relative to the operational phase alone, the combined effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for operational phase individually. The impact of disturbance at seal haul outs has been assessed as negligible.
Indirect impacts on prey		Negligible	Negligible	Negligible	During construction, O&M and decommissioning activities, there is the potential for loss of existing habitat which currently provides foraging/spawning/nursery habitat for prey fish species. However

Marine Mammals					
					Chapter 10: Fish and Shellfish concluded that there are no significant impacts to fish species predicted during each Project phase individually. Given the high level of spatial overlap, the expected degree of recoverability in benthic communities, and extent of alternative similar habitat available in the region, it is expected that Project lifetime effects will not result in combined effects of greater significance than the assessments for each individual phase.
Entanglement in sub-sea structures		n/a	Minor adverse	n/a	The effects from entanglement in sub-sea structures will commence once the operation phase begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relates to impact duration. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Across the project lifetime, the effects on marine mammal receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Receptor-based Effects					
There is potential for interactions between effects of multiple impact pathways. Each of the above impacts have been assigned an individual significance of negligible to minor adverse. However, some of the impacts outlined are mutually exclusive. For example, vessel disturbance is expected to result in displacement of marine mammals, which in turn will reduce the risk of vessel collision. Overall, it is predicted that no inter-related effects will occur of greater significance than the individual effects assessed in isolation.					

29.4.3 Human Environment

Seascape and Visual Impacts

29.4.3.1 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on seascape, landscape and visual receptors and vice versa.

29.4.3.2 Inter-relationships are considered to be the impacts and associated effects of different aspects of the Project on the same receptor. In the Seascape and Landscape Visual Impact Assessment (SLVIA) study area, these inter-related effects are considered to be receptor led effects, where specific receptors may be affected by both the construction and operation of the offshore infrastructure (including array area, offshore platforms, offshore cable corridor) and the construction and operation of the onshore infrastructure (i.e. onshore substation, onshore cable corridor and landfall location). There is potential for effects to interact, spatially and temporally, to create inter-related effects on a receptor.

29.4.3.3 The SLVIA presented in Chapter 13: Seascape and Visual Impacts and Chapter 21: Landscape and Visual Impacts assessment together provide an assessment of the whole Project effects, i.e. of both the construction and operation of the offshore elements and the onshore infrastructure.

29.4.3.4 An assessment of inter-related effects has been undertaken in Chapter 13: Seascape and Visual Impacts and summarised in Table 29.9, to assess any areas where the construction and operation of the offshore elements and the construction and operation of the onshore infrastructure combine, or inter-relate, to have an effect.

Table 29.9 Summary of the potential project lifetime inter-related effects

Seascape and Visual Impacts
Receptor-based Effects
Based on the assessments undertaken in Chapter 13: Seascape and Visual Impacts and Chapter 21: Landscape and Visual Impacts, it is assessed that potential for inter-related effects only exists for Seascape Character Area (SCA) 31 Outer Milford Haven and Viewpoint 5 (St Ann's Head) and Viewpoint 7 (West Angle Bay), through the potential change in views and perceived character resulting from views of the construction of the Proposed Development and onshore infrastructure at the landfall in West Angle Bay. These inter-related effects are assessed as most likely to occur in the localised area of SCA 31 within the Pembrokeshire Coast National Park (PCNP), within close proximity to the landfall. However, the assessment determined that inter-relation between effects from construction of the landfall and onshore cable route together with effects from the construction of the offshore elements of the Proposed Development will not result in significant impacts on character. This is attributed to the short duration of temporal overlap between the two construction periods. Additionally, inter-related effects are assessed as likely to occur from a localised area of current cLCA25 Hundleton and Lamphey on the inland edge of the PCNP, where there is an elevated area affording views west to the Proposed Development and north-east towards the onshore substation. Although the onshore substation will be partially visible in the view north-east, it will largely be screened behind Wallaston Farm and the intervening landform. It will be seen in the context of the overhead transmission lines and Power Station to the north, therefore the unlikely to combine to greater effects than assessed for the Proposed Development alone (in Chapter 13: Seascape and Visual Impacts), or the onshore substation alone in Chapter 21: Landscape and Visual Impacts.

Offshore Archaeology and Cultural Heritage

29.4.3.5 An assessment of impacts arising from construction, operation and decommissioning of the Project was conducted in Chapter 14: Offshore Archaeology and Cultural Heritage. The worst-case assessment of impacts to historic assets assessed within the chapter is considered robust and has considered all potential impact pathways. Where appropriate mitigation measures are recommended to avoid or reduce any potential impacts that may occur.

29.4.3.6 Inter-related effects are those impacts and effects which may arise from different aspects of the development on the same receptor. They include:

- Project lifetime effects. These include effects which occur during more than one phase of the project (construction, operation, maintenance and decommissioning) and the potential for these effects to interact and create a more significant effect on a receptor than in isolation; and
- Receptor led effects: These include the potential for effects to interact (both spatially and temporally) to create inter-related effects on a receptor. Such effects may be short term, temporary or longer term.

29.4.3.7 In consideration of effects arising throughout the project lifetime, the effects upon marine archaeology would primarily occur within the construction phase of the development, though depending on the parameters for decommissioning this phase too may result in impacts. Avoidance is the primary aim for the protection of archaeological remains in all phases. Mitigation has been recommended for each phase and impacts would not exceed minor. Lower levels of impact are anticipated during the operations and maintenance phase and activities during this phase will principally be focused in areas which were impacted during the construction phase, and activities will avoid known archaeological receptors through continued adherence to Archaeological Exclusion Zones (AEZs). It is therefore considered that impacts in the operation phase will not contribute to inter-related effects. The construction and decommissioning phases will be separated by a significant period of time and as such there will be no interaction between the two phases. It is therefore concluded that there will be no inter-related effects of greater significance compared to the impacts considered alone.

29.4.3.8 Receptor led effects include inter-related effects from the combination of disturbance or direct impact on known archaeological receptors. Avoidance is the primary aim for the protection of archaeological remains in all phases and this will primarily be achieved through input into the project layout and use of AEZs and Temporary Archaeological Exclusion Zones (TAEZs). It is therefore predicted that any inter-related effect will not be of any greater significance than those already assessed in isolation (i.e. negligible to minor adverse).

Commercial Fisheries

29.4.3.9 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the project may potentially further contribute to the impacts assessed on commercial fisheries and *vice versa*.

29.4.3.10 The worst-case impacts assessed within Chapter 15: Commercial Fisheries take these interactions into account and, therefore, the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts, and will be included within the inter-related assessment:

- Change in distribution of commercially exploited fish and shellfish populations. This has been assessed within both Chapter 15: Commercial Fisheries and Chapter 10: Fish and Shellfish Ecology;
- Snagging resulting from seabed obstruction. This has been assessed both within Chapter 15: Commercial Fisheries, Chapter 16: Shipping and Navigation, and in Technical Appendix 16.1: Navigational Risk Assessment;
- Collision risk between fishing vessels and Project vessels. This has been assessed within Chapter 15: Commercial Fisheries, Chapter 16: Shipping and Navigation, and in Technical Appendix 16.1: Navigational Risk Assessment; and
- Change in navigable water depth. This has been assessed within Chapter 15: Commercial Fisheries, Chapter 16: Shipping and Navigation, and Technical Appendix 16.1: Navigational Risk Assessment.

29.4.3.11 The potential for interrelated effects to arise from these pathways is set out in Table 29.10. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect commercial fisheries receptors.

Table 29.10 Summary of the potential project lifetime inter-related effects

Commercial Fisheries					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Change in distribution of commercially exploited fish and shellfish populations.		n/a	Minor beneficial	n/a	The Project lifetime effect of protection of benthic habitats from fishing across all project phases will be of greater duration than for each phase considered individually. However, both the construction and decommissioning phases last for a relatively short time (8 months) relative to the operational phase (up to 25 years). Consideration of multiple Project phases would not be associated with an increase in terms of spatial extent, as effects will be limited to the array area in all cases; therefore the magnitude of change will not change. Given the relatively small increase in duration for all Project phases relative to the operational phase alone, the combined effect of impacts over the Project lifetime is not predicted to result in effects of greater significance than those assessed for operational phase individually.
Snagging resulting from seabed obstruction.		Minor adverse	Minor adverse	n/a	The risk of snagging caused by the presence of project infrastructure will commence when offshore construction begins, increasing incrementally up to the realistic worst-case scenario, which is represented by the fully operational project. The magnitude of change will not increase above this worst-case scenario; the only difference in assessment of Project lifetime effects and operation phase effects relate to impact duration. However, the construction phase last for a relatively short time (8 months) relative to the operational phase (up to 25 years).

Commercial Fisheries					
					Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance.
Collision risk between fishing vessels and Project vessels.		Minor adverse	Minor adverse	Minor adverse	The scale of effects on commercial fisheries progressively increases during the construction phase, as the semi-submersible floating platform, WTGs and ancillary structures are installed and become operational, and a greater number of vessels are increasingly displaced. The temporal effect will be lengthened across the Project lifetime with the implementation of the proposed mitigation. However, the effects on commercial fisheries are not anticipated to interact in such a way that will result in combined effects of greater significance than the assessments presented for each individual phase.
Change in navigable water depth.		Minor adverse	Minor adverse	Minor adverse	
Receptor-based Effects					
An increase in vessel numbers, and displacement of fisheries vessels into other areas, has the potential to have direct effects on commercial fish species, marine mammals and offshore ornithology. However, whilst impacts may interact with others, such as subsea acoustic emissions associated with UXO clearance, in such a way as to cause an increase in overall disturbance to commercial fish species, the contribution of Project to disturbance will be very small. Accordingly, it would not be sufficient to increase any of the individual effect significance levels (i.e. **minor adverse**).					

Shipping and Navigation

29.4.3.12 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the project may potentially further contribute to the impacts assessed on shipping and navigation and *vice versa*.

29.4.3.13 The worst-case impacts assessed within Chapter 16: Shipping and Navigation take these interactions into account and therefore the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts, and will be included within the inter-related assessment:

- Vessel-to-vessel collision due to presence of project-related vessels and displacement of vessels from the array area. This has been assessed within Chapter 16: Shipping and Navigation, Chapter 15: Commercial Fisheries, and Technical Appendix 15.1 Commercial Fisheries Technical Report;
- Vessel-to-structure contact due to presence of the semi-submersible floating platform/WTGs (in place). This has been assessed within Chapter 16: Shipping and Navigation, Chapter 15: Commercial Fisheries, and Technical Appendix 15.1 Commercial Fisheries Technical Report;
- Snagging with semi-submersible floating platform/WTG moorings, inter array cable or the export cable. This has been assessed within Chapter 16: Shipping and Navigation, Chapter 15: Commercial Fisheries, and Technical Appendix 15.1 Commercial Fisheries Technical Report; and
- Change in navigable water depth. This has been assessed within Chapter 16: Shipping and Navigation, Chapter 15: Commercial Fisheries, and Technical Appendix 15.1 Commercial Fisheries Technical Report.

29.4.3.14 The potential for interrelated effects to arise from these pathways is set out in Table 29.11. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect marine mammals and marine ornithology.

Table 29.11 Summary of the potential project lifetime inter-related effects

Shipping and Navigation					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Vessel-to-vessel collision due to presence of project-related vessels and displacement of vessels from the array area.		Minor adverse	Minor adverse	Minor adverse	The scale of effects on shipping and navigation progressively increases during the construction phase, as the semi-submersible floating platform/WTGs and ancillary structures are installed and become operational, and a greater number of vessels are increasingly displaced. Although the temporal effect is lengthened, with the implementation of the proposed mitigation, across the Project lifetime the effects on shipping and navigation are not anticipated to interact in such a way that will result in combined effects of greater significance than the assessments presented for each individual phase.
Vessel-to-structure contact due to presence of semi-submersible floating platform/WTGs (in place).		Minor adverse	Minor adverse	Minor adverse	
Snagging with semi-submersible floating platform/WTG moorings, inter array cable or the export cable.		Minor adverse	Minor adverse	Minor adverse	
Change in navigable water depth.		Minor adverse	Minor adverse	Minor adverse	
Receptor-based Effects					
An increase in vessel numbers, and displacement of vessels into other areas, has the potential to have direct effects on marine mammals and reptiles and offshore ornithology. However, whilst impacts may interact with others, such as subsea acoustic emissions associated with UXO clearance, in such a way as to cause an increase in overall disturbance to these receptors, the contribution of shipping and navigation to overall disturbance will be very small. Accordingly, it would not be sufficient to increase the significance of any of the individual effect significances (i.e. **minor adverse**).					

Aviation and Radar

29.4.3.15 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on aviation and radar and *vice versa*.

29.4.3.16 The worst-case impacts assessed within Chapter 17: Aviation and Radar take these interactions into account and, therefore, the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts, and will be included within the inter-related assessment:

- Creation of aviation obstacle to fixed wing and rotary aircraft operating offshore. This has been assessed within Chapter 17: Aviation and Radar; and
- The risk of WTGs causing Interference on civil and military radar systems. This has been assessed within Chapter 17: Aviation and Radar.

29.4.3.17 The potential for interrelated effects to arise from these pathways is set out in Table 29.12. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect airspace users.

Table 29.12 Summary of the potential project lifetime inter-related effects

Aviation and Radar					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Creation of Aviation Obstacle to Fixed Wing and Rotary Aircraft Operating Offshore		Negligible	Minor adverse	Negligible	Pilots are obliged to plan their flying activities in advance, and to be familiar with any enroute obstacles they may encounter and will be notified of all project phases through notification procedures outlined in Chapter 17: Aviation and Radar. Therefore, across the Project lifetime, the effects on aviation and radar receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase
WTG causing Interference on Civil and Military Radar Systems		n/a	Minor adverse	n/a	Effects from WTGs will only occur during the operational phase. As such, there is no potential for this pathway to cause Project lifetime inter-related effects.
Receptor-based Effects					
The greatest potential for spatial and temporal interactions is likely to occur due to interaction of an aviation obstacle and the reduction of airspace. The individual standalone impacts were assigned significance of minor adverse. ATS provision and the rules of air, including the see and be seen principle, will mean reduced potential for interaction between inter-related effects. It is therefore anticipated that the significance of these combined effects on airspace users will not be of any greater significance than the effects when assessed in isolation (**moderate** (prior to mitigation) or **minor adverse** (following mitigation)).					

Coastal and Marine Infrastructure and Other Users

29.4.3.18 The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the project may potentially further contribute to the impacts assessed on coastal and marine infrastructure and other users and *vice versa*.

29.4.3.19 The worst-case impacts assessed within Chapter 18: Coastal and Marine Infrastructure and Other Users take these interactions into account and, therefore, the impact assessments are considered conservative and robust. However, potential for interaction is identified for the following impacts, and will be included within the inter-related assessment:

- Disturbance and obstruction to other marine renewable project activities by works vessels. This has been assessed within Chapter 18: Coastal and Marine Infrastructure and Other Users and Chapter 16: Shipping and Navigation;
- Disruption to firing exercise and other military activities due to vessel presence. This has been assessed within Chapter 18: Coastal and Marine Infrastructure and Other Users; and
- Damage or disturbance to existing cables. This has been assessed within Chapter 18: Coastal and Marine Infrastructure and Other Users.

29.4.3.20 The potential for interrelated effects to arise from these pathways is set out in Table 29.13. These are divided into project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases. No receptor-led inter-related effects were identified for this topic area.

Table 29.13 Summary of the potential project lifetime inter-related effects

Coastal and Marine Infrastructure					
Impact	**Residual Effects**				**Inter-related Effects Over Project Lifetime**
	Phase	**Construction**	**O&M**	**Decommissioning**	
	Duration	**8 Months**	**≤25 Years**	**8 Months**	
Disturbance and obstruction to other marine renewable project activities by works vessels		Minor adverse	Minor adverse	Minor adverse	Both receptor sensitivity and impact magnitude has been determined to be low in all project phases. Although consideration of Project lifetime effects will increase overall duration, it is expected that the significance of this effect will be maintained at the same level throughout the project. As such, the effects on Coastal and Marine Infrastructure and Other Users are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Disruption to firing exercise and other military activities due to vessel presence		Minor adverse	Minor adverse	Minor adverse	Impact magnitude was determined to be low, and receptor sensitivity medium for all project phases. Although this receptor is considered to be of medium sensitivity, as the area is in use by the military, with limited capacity to accommodate the anticipated impact, any disturbance would be short-term. It is therefore expected that the significance of this effect will be maintained at the same level throughout the project. As such, the effects on Coastal and Marine Infrastructure and Other Users are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Damage or disturbance to existing cables		Minor adverse	Minor adverse	Minor adverse	The use of Crossing and Proximity Agreements is expected to reduce the risk of damage or disturbance to existing cables to acceptably low levels for all Project phases. In view of this, the magnitude of impact was determined as negligible within Chapter

Coastal and Marine Infrastructure					
					18: Coastal and Marine Infrastructure and Other Users. However, this receptor is deemed to be of high sensitivity due to the infrastructure's inability to avoid any potential impacts. Although the temporal effect is lengthened when considering Project lifetime effects, with the proposed mitigation implemented across the project lifetime, the effects on existing cables are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.

29.5 Onshore Assessment Methodology and Significance Criteria

29.5.1 Study Area

29.5.1.1 The study area for the assessment of inter-related effects has been informed by the study areas used in the topic-specific assessments. As a general rule, there is a greater potential for inter-related effects in close proximity to the onshore elements of the Project as, for many topic areas, the number and significance of likely effects decreases with distance.

29.5.1.2 Due to the differing spatial extent of effects experienced by different onshore receptors, the study area for potential inter-related effects varies according to topic and receptor. The potential inter-related effects considered in this chapter are, therefore, limited to the study areas defined in each of the topic specific chapters.

29.5.2 Desk Study

29.5.2.1 Details of the baseline environments for the receptor groups considered in these inter-related effects chapter are specific to each receptor group and are, therefore, set out in the relevant topic-specific chapters. This chapter draws on the baseline information within the individual chapters. The relevant chapters drawn upon in these inter-related effects (onshore) assessment are as follows:

- Chapter 19: Onshore Geology, Hydrogeology and Hydrology;
- Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornythology;
- Chapter 21: Landscape and Visual Impact;
- Chapter 22: Onshore Noise and Vibration;
- Chapter 23: Onshore Archaeology and Cultural Heritage;
- Chapter 24: Land Use;
- Chapter 25: Traffic and Transport;
- Chapter 26: Air Quality; and,
- Chapter 27: Socio-economics.

29.5.3 Assessment Methodology

29.5.3.1 The approach to assessing inter-related effects within this chapter has followed a four stage process, as summarised in Table 29.14 and outlined in the following paragraphs.

Table 29.14 Summary of staged approach to the inter-related effects assessment for the Project.

Stage	Description
1	Assessments undertaken for individual EIA topic areas within Volume 1, chapters 19 to 27.
2	Review of the assessments set out within Volume 1, chapters 19 to 27 to identify any receptor groups that may be affected by more than one topic area.

Stage	Description
3	Identification of potential inter-related (onshore) effects on these receptor groups, including consideration of the extent to which potential inter-related effects are already considered within the Environmental Statement.
4	Assessment of how individual effects may combine to create inter-related effects on each receptor group for: 'project lifetime effects' (i.e. during construction, O&M, and decommissioning phases); and 'receptor-led effects' (i.e. multiple effects on a single receptor).

29.5.4 Stage 1: Topic-specific assessments

29.5.4.1 The first stage of the assessment of inter-related (onshore) effects is presented in each of the individual onshore topic chapters and comprises the individual assessments of effects on receptors across the construction, O&M, and decommissioning phases of the onshore elements of the Project.

29.5.4.2 The findings of these assessments are presented in Chapters 19 to 27 of the ES.

29.5.5 Stage 2: Identification of receptor groups

29.5.5.1 Stage 2 involved a review of the assessments undertaken in the topic-specific chapters to identify 'receptor groups' requiring assessment within the inter-related effects assessment. The term 'receptor group' is used to highlight that the approach taken for the inter-related effects assessment does not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors. The receptor groups assessed can be broadly categorised as follows:

- Geology and ground conditions: geologically designated sites; land/soils; groundwater (including aquifers and Source Protection Zones);
- Hydrology and flood risk: surface water bodies; flood risk (residents; other land uses);
- Ecology and nature conservation: ecologically designated sites; important habitat features; protected species;
- Landscape and visual resources: designated sites; landscape character; visual receptors (residents; users of public rights of way; other visual receptors);
- Archaeology and Cultural Heritage: buried archaeology; designated heritage assets; settings of heritage assets;
- Land use: agricultural land; farm businesses;
- Traffic and transport: road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities);
- Noise and vibration: residents, users of public rights of way; users of other land uses (e.g. places of work);
- Air quality: residents; places of public amenity/public attractions; places of work; schools/hospitals; species/habitats; and
- Socio-economics: employment levels, housing and other local services; tourism; renewable energy sector; users of public rights of way.

29.5.5.2 The potential for inter-related effects was considered in further detail at Stage 3.

29.5.6 Stage 3: Identification of potential inter-related effects on receptor groups

29.5.6.1 Consideration was given to the potential for inter-related effects to arise for each of the identified receptor groups across the three project phases (i.e. project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in Table 29.15.

Table 29.15: Definitions of project lifetime and receptor led inter-related effects.

Effect Type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the project, (construction, O&M, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. construction phase noise, operational noise and noise during decommissioning and dismantling at the onshore substation).
Receptor-led effects	Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, all effects on a given receptor such as local residents – construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Project lifetime effects

29.5.6.2 With respect to the potential for effects to occur in more than one phase of the project (project lifetime effects), Table 29.16 identifies the potential for inter-relationships to occur and considers whether any potential effects are already considered within the Environmental Statement.

Table 29.16: Potential for project lifetime effects.

Receptor group	Potential for project lifetime effect
Geologically designated sites	Chapter 19: Onshore Geology, Hydrogeology and Hydrology identifies that no designated geological sites would be directly affected by the onshore elements of the Project. As there would be no impact on these sites arising from any phase of the Project, there is not considered to be any potential for project lifetime effects for this receptor group.
Land/soil (contamination)	Chapter 19: Onshore Geology, Hydrogeology and Hydrology considers the potential for effects arising from contamination. No existing contaminated land sites have been identified within the study area for the onshore elements of the Project. The assessment does not identify the potential for any contamination of land/soils arising from the construction, operation or decommissioning of the onshore elements of the Project. Therefore, there is not considered to be any potential for project lifetime effects for this receptor group.
Groundwater (including aquifers and Source Protection Zones)	Chapter 19: Onshore Geology, Hydrogeology and Hydrology considers the effects on groundwater. Some limited effects on secondary aquifers, groundwater quality and flow are identified during all phases, although these are not significant. Project lifetime effects on groundwater receptors are considered within section 29.5.7 of this chapter.
Surface water bodies (quality, flow)	Chapter 19: Onshore Geology, Hydrogeology and Hydrology. The only project lifetime effect is the pollution impact from sediment run-off/transport during construction and the increased rate of surface water run-off at the onshore substation location. Project lifetime effects on these assets are considered within section 29.5.7 of this chapter.
Ecologically designated sites	Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology considers effects on ecologically designated sites. Such effects would be very limited during the construction phase, as the design of the onshore elements of the Project has sought to avoid direct effects as far as practicable. Some limited effects may also occur during decommissioning, but these would be no greater than (and are likely to be less than) those arising during construction. No effects on designated sites would occur during the operation and maintenance phase. Therefore, there is no potential for effects to occur throughout the whole project lifetime. The combined effect of the construction and decommissioning effects would not be likely to exceed the magnitude of impact and significance of effect described for the construction phase (up to minor adverse significance, which is not significant). Therefore, no significant project lifetime effects are considered likely.

Habitats and species	The majority of effects on habitats and species would occur during the construction phase, including any permanent habitat loss, which is assessed in Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology. There is some potential for some effects on habitats and species to also occur during the decommissioning phase. Only effects relating to the permanent infrastructure (relating to disturbance and water quality) have some potential to continue through to the operation and maintenance phase. Given the commitment to the enhancement measures outlined in Chapter 20, there is an overall beneficial impact through the enhancement of the habitat conditions and connectivity across the onshore site boundary. Therefore, there are no further inter-related lifetime effects beyond the non-significant effects described in chapter 20's assessment.
Landscape designated sites	Chapter 21: Landscape and Visual Impact identifies that there are no significant landscape or seascape character effects as a result of the Project, either during construction, operation or decommissioning. There are likely significant visual effects as a result of the construction activities associated with the onshore substation however in year 15 once mitigation planting has matured, residual visual effects are not found to be significant for any of the viewpoints assessed. Therefore, no project lifetime effects are anticipated.
Landscape character	Chapter 21: Landscape and Visual Impact considers effects on landscape character. Effects relating to the cable route would occur during the construction phase. However, some effects on landscape character arising from the permanent onshore infrastructure are identified during all phases of the project. Therefore, project lifetime effects on landscape character are considered within section 29.5.7 of this chapter.
Buried archaeology	Chapter 24: Onshore Archaeology and Cultural Heritage sets out the effects on buried archaeology. Effects on buried archaeology would occur during the construction phase of the project and would be permanent. No further effects would occur during other phases of the project and, therefore, no project lifetime effects would occur.
Heritage assets and their settings	Chapter 24: Onshore Archaeology and Cultural Heritage considers the effects on heritage assets and the historic landscape. A number of effects would occur during the construction phase only. Within the Onshore Archaeological and Cultural Heritage assessment the Historic Landscape Character Area 341 Rhoscrowther is the only receptor to be affected during both construction and operational phases of the Proposed Development. Therefore, project lifetime effects on Heritage assets and their settings are considered within section 29.5.7 of this chapter.
Agricultural land and farm businesses	Chapter 25: Land Use considers the effects on agricultural land quality and farm holdings. The permanent loss of agricultural land and effects on farm holdings associated with the onshore elements of the Project would occur during the construction phase. No additional effects would occur during the O&M phase. Decommissioning effects have been scoped out of the assessment of effects on land use. Therefore, there is not considered to be any potential for project lifetime effects for this receptor group.

Socio-economic factors (tourism).	Chapter 27: Socio-economics considers effects on these receptor groups. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 29.5.7 of this chapter.
Humans (travellers, residents, users of schools/hospitals, community facilities, places of work)	Chapters 21: Landscape and Visual Impact, 26: Traffic and Transport, 23: Noise and Vibration and 27: Air Quality consider effects on local residents and those using community facilities/employed in the local area. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 29.5.7 of this chapter.
Humans (pedestrians/cyclists, users of public rights of way)	Chapters 21: Landscape and Visual Impact, 26: Traffic and Transport, 23: Noise and Vibration and 27: Air Quality consider effects on users of public rights of way and the road network, where relevant. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 29.5.7 of this chapter.

29.5.6.3 Based on the above, the following receptor groups may experience effects across a number of project phases:

- Groundwater receptors;
- Surface water bodies;
- Habitats and species;
- Landscape character;
- Heritage assets (setting and the historic landscape);
- Socio-economic factors (tourism, renewable energy sector);
- Humans (residents, users of schools/hospitals, community facilities, places of work). These include the closest long-term receptors - people living at dwellings closest to the onshore elements of the Project; and
- Humans (travellers, pedestrians/cyclists, users of public rights of way). These include the closest intermittent receptors - people using Public Rights of Way (PRoWs) (and other linear routes) closest to the onshore elements of the Project

29.5.6.4 The potential for project lifetime effects on the above receptor groups is considered within this inter-related effect chapter.

Receptor-led effects

29.5.6.5 With respect to the potential for interaction of multiple effects on a receptor (receptor-led effects), Table 29.17 identifies potential for inter-relationships to occur for each receptor group and considers whether any potential effects are already considered within the ES.

Table 29.17: Potential for interaction between topic areas to result in inter-related effects on receptor groups.

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
Agricultural Land and Farm Businesses	No	No	No	No	N/A	No	No	No	No	Effects on Agricultural Land are considered in Chapter 24 - Land Use. There is no potential for inter-related effects (with other topic areas) on this receptor group.
Buried Archaeology	No	No	No	N/A	No	No	No	No	No	Effects on Buried Archaeology are considered in Chapter 23 - Onshore Archaeology and Cultural Heritage. There is no potential for inter-related effects (with other topic areas) on this receptor group.
Ecologically designated Sites	Yes (water quality)	N/A	No	No	No	No	Yes	Yes	No	Effects on ecologically designated sites are considered in Chapter 20 - Terrestrial and Coastal Ecology and Onshore Ornithology. The effects of noise (disturbance) and vibrations on ecological receptors are considered in Chapter 22: Onshore Noise and Vibration. Consideration of dust effects on ecological receptors (where relevant) is provided in Chapter 26 - Air Quality.
Habitats and Species	Yes (water quality)	N/A	No	No	No	No	Yes	Yes	No	
Surface Water Bodies (quality, flow)	N/A	Yes	No	No	No	No	No	No	No	

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
										Effects on ecological receptors (habitats and species) affected by changes in surface water quality are considered in Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology. The assessment of impacts arising from construction, operation and decommissioning of the Project indicate, when taking into account the proposed standard and specific mitigation, that there are no significant adverse impacts on ecological features identified. Therefore, there are no further inter-related receptor-led effects anticipated for the Project beyond the effects described in the assessment in volume 1, chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology.
Geologically designated Sites	N/A	No	No	No	No	No	No	No	No	Effects on Geologically designated Sites are considered in Chapter 19 - Onshore Geology, Hydrogeology and Hydrology. There is no potential for inter-related effects (with other topic areas) on this receptor group.

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
Groundwater (including aquifers and Source Protection Zones)	N/A	No	No	No	No	No	No	No	No	Effects on Groundwater are considered in Chapter 19 - Onshore Geology, Hydrogeology and Hydrology. There is no potential for inter-related effects (with other topic areas) on this receptor group.
Heritage assets and their settings	No	No	Yes (visual)	N/A	No	No	No	No	No	Effects on Heritage assets and their settings are considered in Chapter 21 - Landscape and Visual Impact and in Chapter 23 - Onshore Archaeology and Cultural Heritage. No specific impacts have been identified however that would further impact upon receptors assessed in these chapters.
Landscape Character	No	No	N/A	Yes	No	No	No	No	No	
Humans (pedestrians / cyclists, users of public rights of way)	No	No	Yes (visual)	Yes (visual)	No	Yes	Yes	Yes (dust)	No	The effects of noise (disturbance) and vibrations on pedestrian receptors are considered in Chapter 22 - Onshore Noise and Vibration. Consideration of dust effects on pedestrian receptors (where relevant) is provided in Chapter 26 - Air Quality. Effects on Tourism and recreational users are considered in Chapter 27 -
Humans (travellers, residents, users of schools / hospitals,	No	No	Yes (visual)	Yes (visual)	No	Yes	Yes	Yes (dust)	No	

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
community facilities, places of work)										Socio-economics, Tourism and Recreation, Chapter 21 - Landscape and Visual Impact and Chapter 22: Onshore Noise and Vibration. These chapters consider the potential effects of the Project on the visual amenity of recreational users in the local area. The assessment of impacts arising from construction, operation and decommissioning of the Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Tourism. These impacts are primarily from reduced access, noise dust and visual annoyance, traffic congestion and reduced amenity from multiple sources, which have the potential to combine and increase the magnitude of impact on tourism and recreation receptors. The worst-case impacts assessed within this Chapter take these interactions into account and therefore the impact assessments are considered conservative and robust. When taking into account proposed standard and specific mitigations, there
Tourism	No	No	Yes (visual)	No	No	No	Yes	Yes (dust)	N/A	

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
										are no significant adverse receptor-led residual effects.
Land / Soil (contamination)	N/A	No	No	No	No	No	No	No	No	Effects on Land / Soil are considered in Chapter 19 - Onshore Geology, Hydrogeology and Hydrology. There is no potential for inter-related effects (with other topic areas) on this receptor group.
Landscape designated Sites	No	No	N/A	Yes	No	No	Yes	No	No	Effects on Landscape designated Sites are considered in Chapter 21 - Landscape and Visual Impact and Chapter 23 - Onshore Archaeology and Cultural Heritage. Both chapters consider the potential effects of the Project on designated Registered Historic Parks and Gardens and their setting within the landscape. No specific impacts have been identified however that would further impact upon receptors assessed in these chapters.

Receptor group	Potential for inter-related effect on receptor group?									Potential inter-related effect considered in the Environmental Statement?
	Geology Hydrogeology and Hydrology	Terrestrial Ecology	Landscape and visual impact	Onshore Archaeology and Cultural Heritage	Land use	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
Renewable Energy Sector	No	No	No	No	No	No	No	No	N/A	Effects on Renewable Energy Sector are considered in Chapter 27 - Socio-economics, Tourism and Recreation. There is no potential for inter-related effects (with other topic areas) on this receptor group.

29.5.6.6 Based on the above, it is clear that most receptor-led inter-related effects are considered within the relevant chapters of the ES. However, two receptor groups may experience effects across a number of environmental topic areas:

- Humans (residents, users of schools/hospitals, community facilities, places of work). These include the closest long-term receptors - people living at dwellings closest to the onshore elements of Hornsea Three; and
- Humans (travellers, pedestrians/cyclists, users of public rights of way). These include the closest intermittent receptors - people using PRoWs (and other linear routes) closest to the onshore elements of Hornsea Three.

29.5.6.7 Some inter-related effects on these receptor groups have been considered elsewhere in the ES. For example, noise effects from traffic are considered in Chapter 22: Noise and Vibration, while dust from traffic is considered in Chapter 26: Air Quality. Nevertheless, due to the number of potential interactions between topic areas, the potential for effects to combine to result in receptor-led effects over and above those identified within the topic chapters are considered within this inter-related effect chapter. The key considerations in the assessment of inter-related effects on these receptors are:

- Noise;
- Dust;
- Views;
- Traffic and transport;
- Land use and recreation; and
- Socio-economics (housing, employment).

29.5.7 Stage 4: Assessment of inter-related effects on each receptor group

29.5.7.1 Individual effects on each of the receptor groups identified above have been considered. It is important to note that the inter-related effects assessment considers only effects produced by the onshore elements of the Project (together with the onshore compounds, storage areas and accesses) and not from other projects, which are considered within the cumulative impact assessment chapter.

29.5.7.2 The significance of the individual effects, as defined in the topic-specific chapters, is presented in the assessment tables for each receptor group (all conclusions for significance of effect assume successful implementation of mitigation measures where appropriate, i.e. the residual effect has been used). A descriptive assessment of the scope for these individual effects to interact to create a different or greater effect has then been undertaken. This assessment incorporates qualitative and, where reasonably possible, quantitative assessments. The assignment of significance of effect for any such inter-related effect is not undertaken, rather, any inter-related effects that may be of greater significance than the individual effects acting in isolation on a given receptor are identified and discussed within this inter-related effect chapter.

Table 29.18: Summary of the potential project lifetime and receptor-led, inter-related effects

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Onshore Geology, Hydrogeology and Hydrology			
Project lifetime effects	Pollution impact from sediment run-off/transport during construction and pollution impact from increased rate of surface water run-off at the onshore substation location.	A negligible adverse effect is predicted on surface water receptors during construction considering standard mitigation measures. A negligible adverse effect is predicted on surface water receptors during operation considering the appropriate design drainage strategy	Considering the negligible adverse effect at the construction and operational phases on local surface watercourses and the mitigation measures in place, it is considering that there is no potential for interrelated impacts on local watercourses to result in a more significant effect.
Receptor-led effects	Pollution impact from sediment run-off / transport during construction and impact on the integrity of banking / geomorphological changes to watercourses combined may create inter-related effects during construction on local hydrology.	A potential negligible adverse effect is predicted on surface water receptors during construction from pollution impact considering standard mitigation measures. There is the potential for a direct, temporary, short-term effect of minor significance from geomorphological changes during construction considering standard mitigation measures	Considering the predicted effects on local hydrology from the individual impact and the standard mitigation measures in place, it is considering that there is the potential for a direct, temporary short-term inter-related effect of minor significance from construction impact.

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Terrestrial and Coastal Ecology and Onshore Ornithology			
Project lifetime effects	The assessment of impacts arising from construction, operation and decommissioning of the Project indicate, when taking into account the proposed standard and specific mitigation, that there are no significant adverse impacts on Important Ecological Features (IEFs) identified. Given the commitment to the enhancement measures outlined above, there is an overall beneficial impact through the enhancement of the habitat conditions and connectivity across the onshore site boundary. Therefore, there are no further inter-related lifetime effects nor receptor-led effects anticipated for the Proposed Development beyond the effects described in the assessment provided in Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology.		
Receptor-led effects			
Landscape and Visual Impact			
Project lifetime effects	Chapter 21: Landscape and Visual Impact identifies that there are no significant landscape or seascape character effects as a result of the Project, either during construction, operation or decommissioning. Therefore, no project lifetime effects are anticipated.		There are likely significant visual effects due to the construction activities associated with the onshore substation. Likely significant visual effects because of the onshore substation are also found for residential receptors, during operation in year 1 once construction activity is completed. However, in year 15 once mitigation planting has matured, residual visual effects are not found to be significant for any of the viewpoints assessed. There is therefore no real potential for LVIA effects to contribute to any significant receptor-led or project lifetime, inter-related effects beyond the effects described in the assessments provided in the in Chapter 21: Landscape and Visual Impact.
Receptor-led effects	There are several different visual inter-related effects that are considered in Chapter 21: Landscape and Visual Impact and Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology, Chapter 23: Onshore Archaeology and Cultural Heritage, Chapter 27: Socioeconomics, Tourism and Recreation and, Chapter 13: Seascape Landscape Visual Impact Assessment.		

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Onshore Noise and Vibration			
Project lifetime effects	Increases in noise and vibration as a result of construction, operation and decommissioning.	Impacts at human receptors were not predicted to be significant for the construction or operational phase subject to appropriate mitigation. The decommissioning phase is not anticipated to give rise to impacts any greater in magnitude than those considered for construction.	Impacts associated with noise and vibration will only be experienced for the duration of each phase. The phases of the project cannot overlap temporally, therefore there is no potential for project lifetime inter-related noise and vibration impacts to occur.
Receptor-led effects	An inter-related effect due to the combination of noise, visual, air quality and traffic effects on human receptors.	Due to concurrent multiple activities, the construction phase presents the most likely opportunity for receptor-led effects. A range of effective onshore construction phase mitigation is proposed as part of Project Erebus, which would be implemented through the CEMP. Given the effectiveness of the mitigation proposed, many effects during construction would be negligible to minor adverse and not significant. These are detailed in the respective chapters. Construction effects would be temporary. The proposed measures would control construction effects as far as reasonably practicable.	On the basis of the assessment undertaken, with mitigation measures, construction noise effects are considered to be not significant. Overall, no inter-related effects across the project phases are anticipated.
Onshore Archaeology and Cultural Heritage			
Project lifetime effects	Impact on the Historic Landscape Character Area 341 Rhoscrowther.	Impacts during the construction phase are predominantly temporary in nature, and do not increase the significance of effect beyond what is assessed in the operational phase alone. Since all operation phase effects have been established as being non-significant, there is therefore no real potential for Traffic and Transportation effects to contribute to any significant project lifetime inter-related effects.	

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Receptor-led effects	The archaeological and cultural heritage resource straddles both the onshore and offshore areas. The offshore resource is assessed in Chapter 14: Offshore Archaeology and Cultural Heritage Resource. No specific impacts have been identified however that would further impact upon receptors assessed in the Onshore Archaeology and Cultural Heritage and vice versa. There is a potential visual impact on archaeological and cultural heritage receptors from the wind turbines themselves. This visual impact is assessed in Chapter 13: Seascape and Visual Impact and Chapter 21: Landscape and Visual Impact. No specific impacts have been identified however that would further impact upon receptors assessed in the Onshore Archaeology and Cultural Heritage and vice versa. There is therefore no real potential for Traffic and Transportation effects to contribute to any significant receptor-led inter-related effects.		
Land Use			
Project lifetime effects	There is no potential for land use effects to contribute to any significant project lifetime or receptor-led, inter-related effects.		
Receptor-led effects			
Traffic and Transport			
Project lifetime effects	Traffic generated by the Proposed Development's construction and decommissioning will have a negligible impact on the highway links on which it will travel. These movements will also have a negligible impact in relation to sensitive receptors living on the construction route, with these receptors unlikely		

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Receptor-led effects	to be affected by any inter-related works associated with the Proposed Development's delivery. There is therefore no real potential for Traffic and Transportation effects to contribute to any significant project lifetime or receptor-led, inter-related effects.		
Air Quality			
Project lifetime effects	There are no operational or decommissioning phase effects on air quality and therefore no potential for project lifetime interrelated effects.		
Receptor-led effects	Construction compound activity at the landfall site occurring simultaneously with cable route construction within 350 m of the landfall site.	Post-mitigation there are non-significant residual effects occurring as a result of the Project's construction phase on human, commercial or ecological receptors.	Considering the temporary and non-significant adverse effect and the mitigation measures in place, it is considering that there is no potential for receptor-led interrelated impacts to result in a more significant effect.
	Construction of the substation occurring simultaneously with cable route construction within 350 m of the substation.		Considering the temporary and non-significant adverse effect and the mitigation measures in place, it is considering that there is no potential for receptor-led interrelated impacts to result in a more significant effect.
Socio-economics, Tourism and Recreation			

Nature	Impact type	Significance of effect (from topic assessment)	Inter-related assessment
Project lifetime effects	Disruption / reduced access to local businesses;	A negligible adverse effect is predicted on local businesses during construction considering standard mitigation measures. A minor adverse effect is predicted on local businesses during operation considering standard mitigation measures.	Considering the non-significant adverse effects during the construction and operational phases on local businesses and the mitigation measures in place, it is considering that there is no potential for Project lifetime interrelated impacts on local businesses to result in a more significant effect.
Receptor-led effects	These impacts are primarily from reduced access, noise dust and visual annoyance, traffic congestion and reduced amenity from multiple sources, which have the potential to combine and increase the magnitude of impact on tourism and recreation receptors. The worst-case impacts assessed within this Chapter take these interactions into account and therefore the impact assessments are considered conservative and robust. When taking into account proposed standard and specific mitigations, there are no significant adverse receptor-led residual effects.		

29.6 Summary

29.6.1.1 The tables presented within this chapter consider the potential for inter-related effects to arise from both offshore and onshore elements of the Project on a range of offshore and onshore receptor groups. Much of the content of these tables has been based on the assessments of individual effects presented in topic-specific EIA Chapters. The identification of potential inter-related effects is primarily a qualitative assessment using expert judgement and noting where inter-related effects have already been accounted for within the assessments in the topic chapters.

29.7 References

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