

# MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

## Environmental Statement

### Volume 2, Chapter 15: Inter-related effects

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**MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS**

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**Prepared by:**

**RPS**

**Prepared for:**

**Morgan Offshore Wind Ltd.**

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### Glossary

Term	Meaning
Adverse Weather	Severe weather that creates potentially unsafe conditions for vessel transits.
Bathymetry	The measurement of depth of water in oceans, seas, or lakes.
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Fishing ground	An area of water or seabed targeted by fishing activity.
Gear type	The method/equipment used for fishing.
Habitat	The environment that a plant or animal lives in.
Important Ecological Features	Habitats, species, ecosystems and their functions/processes that are considered to be important and potentially impacted by a proposed development.
Inter-related effects	Multiple effects upon the same receptor arising from the Morgan Generation Assets. These occur either where a single effect acts upon a receptor over time to produce a potential additive effect or where a number of separate effects, such as underwater sound and collision risk, affect a single receptor.
Invasive species	An introduced organism that becomes overpopulated and negatively alters its new environment.
Landscape	An area, as perceived by people, the character of which is a result of the action and interaction of natural and/or human factors.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Littoral currents	Flow derived from tide and wave climate.
Nursery habitat	A habitat where juveniles of a species regularly occur as a population.
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Morgan Generation Assets (construction, operations and maintenance 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. underwater sound effects from construction piling, operational wind turbines, vessels and decommissioning).
Receptor-led effects	Assessment of the scope for multiple effects to interact to create inter-related effects on a receptor. As an example, multiple effects on a given receptor such as benthic habitats (e.g. direct habitat loss or disturbance, sediment plumes, scour, jack-up vessel use etc.) may interact to produce a different or 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.
Seascape	The visual and physical conjunction of land and sea which combines maritime, coast and hinterland character.
Sandwave	A lower regime sedimentary structure that forms across from tidal currents.

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Term	Meaning
Scour protection	Measures to prevent loss of seabed sediment around any structure placed in or on the seabed (e.g. by use of protective aprons, mattresses, rock and gravel placement).
Shellfish	For the purposes of this assessment, shellfish is considered a generic term to define molluscs and crustaceans.
Snagging	Fishing gear or anchors coming fast on subsurface infrastructure such as cables.
Spawning grounds	Spawning grounds are the areas of water or seabed where fish spawn or produce their eggs.
Species	A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
Static gear	Gear that is set to catch fish or shellfish. This is a collective term and includes gear that remains static and is not towed, such as pots, traps and set nets.
Subtidal	Area extending from below low tide to the edge of the continental shelf.
Visual amenity	The overall pleasantness of the views people enjoy in their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.

## Acronyms

Acronym	Description
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
FLCP	Fisheries Liaison and Co-existence Plan
GVA	Gross Value Added
HVAC	High Voltage Alternating Current
IEF	Important Ecological Feature
INNS	Invasive and Non-Native Species
MCZ	Marine Conservation Zone
MOD	Ministry of Defence
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Project
OSP	Offshore Substation Platform
PAD	Protocol for Archaeological Discoveries

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Acronym	Description
REWS	Radar Early Warning Systems
SAR	Search and Rescue
SMZ	Scallop Mitigation Zone
SSC	Suspended Sediment Concentration
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation
Zol	Zone of Influence

## **15 Inter-related effects**

### **15.1 Introduction**

#### **15.1.1 Overview**

15.1.1.1 This chapter of the Environmental Statement identifies, describes and assesses the potential inter-related effects of the Morgan Offshore Wind Project: Generation Assets (hereafter referred to as the Morgan Generation Assets) during the construction, operations and maintenance and decommissioning phases.

15.1.1.2 The assessment presented has taken into account other relevant impact assessments and Annexes in this Environmental Statement including:

- Volume 2, Chapter 1: Physical processes of the Environmental Statement
- Volume 2, Chapter 2: Benthic subtidal ecology of the Environmental Statement
- Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement
- Volume 2, Chapter 4: Marine mammals of the Environmental Statement
- Volume 2, Chapter 5: Offshore ornithology of the Environmental Statement
- Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement
- Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement
- Volume 2, Chapter 8: Marine archaeology and cultural heritage of the Environmental Statement
- Volume 2, Chapter 9: Other sea users of the Environmental Statement
- Volume 2, Chapter 10: Seascape, landscape and visual resources of the Environmental Statement
- Volume 2, Chapter 11: Aviation and radar of the Environmental Statement
- Volume 2, Chapter 12: Climate change of the Environmental Statement
- Volume 2, Chapter 13: Socio-economics of the Environmental Statement
- Volume 2, Chapter 14: Human health of the Environmental Statement.

#### **15.1.2 Purpose of chapter**

15.1.2.1 The primary purpose of the Environmental Statement is outlined in Volume 1, Chapter 1: Introduction and overarching glossary of the Environmental Statement. In summary, the primary purpose of an Environmental Statement is to provide the environmental information which has been gathered in order to carry out an assessment of the likely environmental effects of the Morgan Generation Assets. It supports the Development Consent Order (DCO) application for the Morgan Generation Assets under the Planning Act 2008 (the 2008 Act). The Environmental Statement is submitted to support the application under the 2008 Act and sets out the findings of the Environmental Impact Assessment (EIA) for the Morgan Generation Assets.

15.1.2.2 In particular, this Environmental Statement chapter presents:



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- The receptor groups considered within the inter-related assessment
- The potential for effects on receptor groups across the three key project phases (construction, operations and maintenance and decommissioning)
- The potential for multiple effects on a receptor group, as presented within the topic-specific chapter, to interact to create inter-related effects.

### 15.1.3 Study area

- 15.1.3.1 Due to the differing spatial extent of effects experienced by different offshore 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, also limited to the study areas defined in each of the topic-specific chapters outlined in paragraph 15.1.1.2. The rationale for the exclusion of other topics from further inter-related effects assessment is presented in section 15.5.2 (see Table 15.4).

## 15.2 Policy context

### 15.2.1 National Policy Statements

- 15.2.1.0 Planning policy on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and legislation of the Environmental Statement. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to inter-related effects, is contained in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1), which sets out the UK Government's policy for the delivery of major energy infrastructure (DESNZ, 2023a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b).
- 15.2.1.1 NPS EN-1 includes guidance on what matters are to be considered in the inter-related assessment. This is summarised in Table 15.1 below. Table 15.1: Summary of the NPS EN-1 provisions relevant to inter-related effects.

Summary of NPS EN-1 provision	How and where considered in the Environmental Statement
<p>All proposals for projects that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project.</p> <p>The Regulations specifically refer to effects on population, human health, biodiversity, land, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them.</p> <p>The Regulations require an assessment of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, transboundary, short, medium, and long-term, permanent and temporary, positive and negative effects at all stages of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects.</p> <p>(EN-1, paragraphs 4.3.1 to 4.3.3)</p>	<p>Project lifetime effects and receptor-led effects are assessed throughout this chapter of the Environmental Statement.</p>

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Summary of NPS EN-1 provision	How and where considered in the Environmental Statement
<p>The Secretary of State should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place. (EN-1, paragraph 4.3.19)</p>	<p>Project lifetime effects and receptor-led effects are assessed throughout this chapter of the Environmental Statement.</p>

**15.3 Consultation**

15.3.1.1 A summary of the key matters raised during consultation activities undertaken to date specific to inter-related effects is presented in Table 15.2.

**Table 15.2: Summary of key matters raised during consultation activities undertaken for the Morgan Generation Assets relevant to inter-related effects.**

Date	Consultee and type of response	Comment	Response to comment raised and/or where considered in this chapter
14 July 2022	Marine Management Organisation (MMO) – Scoping Opinion	In relation to fish ecology and fisheries, the MMO noted that the general approach to assessing potential cumulative and inter-related impacts as described in Part 1, Section 4 of the scoping report seems appropriate.	A detailed assessment of inter-related effects on fish and shellfish ecology is provided in Table 15.8.
22 July 2022	The Planning Inspectorate – Scoping Opinion	Inter-related effects of climate change: The Scoping Report explains that inter-related effects will be assessed within each relevant aspect Chapter, assessing how climate change may affect the future baseline scenario. The Inspectorate is content with this approach. The ES should cross-reference other relevant Chapters where this is assessed in for clarity.	The assessment of inter-related effects is central to the assessment of potential effects on climate change and has therefore been assessed within Volume 2, Chapter 12: Climate change of the Environmental Statement and individual chapters as applicable. No additional levels of effects are therefore considered to occur beyond those identified in Volume 2, Chapter 12: Climate change of the Environmental Statement and individual chapters of the Environmental Statement. See also Table 15.4.

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<b>Date</b>	<b>Consultee and type of response</b>	<b>Comment</b>	<b>Response to comment raised and/or where considered in this chapter</b>
02 June 2023	Natural England – S42 consultation response	In relation to marine mammals, Natural England agree with the statement that the inter-related effects have potential to create a more significant effect on a receptor than if just assessed in isolation. Thus, this assessment needs to be given the appropriate credence and the outcomes of the inter-related effects assessment should be presented here. In particular, the inter-related effects from disturbance should be assessed adequately.	A detailed assessment of inter-related effects on marine mammals is provided in Table 15.9.
02 June 2023	Natural Resources Wales (NRW) – S42 consultation response	In relation to marine mammals, NRW considered that inter-related effects from disturbance had not been assessed adequately. NRW noted that the effect of behavioural disturbance from piling was assessed as reversible, with animals returning to baseline levels after piling has ceased. NRW interpreted this to mean that animals would be disturbed over a range dictated by the ‘loudest’ noise (i.e. piling) only when piling is taking place. On non-piling days (given that animals would be expected to return) disturbance from other pathways could still occur, adding to the combined stressor load.	A detailed assessment of inter-related effects on marine mammals is provided in Table 15.9.
02 June 2023	Natural Resources Wales (NRW) – S42 consultation response	In relation to marine mammals, NRW commented that further assessment is required to support the conclusion of piling effects on grey seal. A stressor can cause disturbance on multiple days to the same animal/or different numbers of animals – partly dependent on flux through the area. Thus on certain days the area of disturbance can be small, on others it is larger. Yet disturbance still occurs on both days and contributes to the total stressor load on the population.	A detailed assessment of inter-related effects on marine mammals is provided in Table 15.9.

## 15.4 Data sources

- 15.4.1.1 The baseline environments for the receptor groups considered in this chapter are specific to each receptor group and are, therefore, set out in the relevant topic-specific chapters. This chapter draws on the conclusions made within the individual chapters for the assessment of impacts acting in isolation on the receptor groups in order to identify, describe and assess potential inter-related effects. The relevant sections drawn upon in this inter-related effects assessment are presented in the Environmental Statement chapters outlined in section 15.1.1.

## 15.5 Impact assessment methodology

- 15.5.1.1 The following sections present the approach for the inter-related effects assessment for the Morgan Generation Assets. The following definition of inter-related effects has been applied throughout this chapter:
- Multiple effects upon the same receptor arising from the Morgan Generation Assets. These occur either where a single effect acts upon a receptor over time to produce a potential additive effect or where a number of separate effects, such as underwater sound and collision risk, affect a single receptor, for example marine mammals.

### 15.5.1 Guidance

- 15.5.1.1 The approach to the inter-related effects assessment has been developed with specific regard to the relevant text in The Planning Inspectorate’s Advice Note Nine (PINS, 2018), whereby the Applicant should (paragraph 4.13):
- ensure that interactions between aspect assessments are taken into account relevant to the worst case scenario(s) established and that careful consideration is given to how these are assessed
  - ensure that the assessment of the worst case scenario(s) addresses 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).

### 15.5.2 Approach to assessment

- 15.5.2.1 The approach to assessing inter-related effects within this chapter has followed a four-stage process, as summarised in Table 15.3 and outlined below.

**Table 15.3: Summary of staged approach to the inter-related effects assessment for the Morgan Generation Assets.**

Stage	Description
1	Assessment of effects undertaken for individual EIA topic areas within chapters 1 to 14.
2	Review of assessments undertaken within chapters 1 to 14 to identify ‘receptor groups’ requiring assessment.
3	Identification of potential inter-related effects on receptor groups through review of the topic-specific assessments in the Environmental Statement chapters.

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Stage	Description
4	<p>Assessment undertaken on how individual effects may combine to create inter-related effects on each receptor group for:</p> <ul style="list-style-type: none"> <li>• 'Project lifetime effects' (i.e. during construction, operations and maintenance and decommissioning phases)</li> <li>• 'Receptor-led effects' (i.e. multiple effects on a single receptor).</li> </ul>

### Stage 1: Topic-specific assessments

15.5.2.2 The first stage of the assessment of inter-related effects is presented in each of the individual Environmental Statement topic chapters and comprises the individual assessments of effects on receptors across the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets.

### Stage 2: Identification of receptor groups

15.5.2.3 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 will 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 those relating to the physical environment, the biological environment and the human environment, as follows:

- Physical environment:
  - Physical processes
- Biological environment:
  - Benthic subtidal ecology
  - Fish and shellfish ecology
  - Marine mammals
  - Offshore ornithology
- Human environment:
  - Commercial fisheries
  - Shipping and navigation
  - Marine archaeology and cultural heritage
  - Other sea users
  - Seascape, landscape and visual resources
  - Aviation and radar
  - Climate change
  - Socio-economics
  - Human health.

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- 15.5.2.4 It is important to note that the significance of effects on different receptors in the same receptor group (i.e. different species of birds) may vary according to the sensitivity of receptors. Therefore, where a number of species have been considered within the assessments in this chapter, a range is provided for significance of effect.
- 15.5.2.5 For some other individual topic chapters, an assessment of potential inter-related effects is inherent within the chapter itself and as such, is not covered in this inter-related effect assessment. The topics where this applies are shown below in Table 15.4.

**Table 15.4: Topics not included in the Morgan Generation Assets inter-related effects assessment.**

\*Items listed in the topic column do not necessarily correspond to a specific Environmental Statement chapter. The topic name presented refers to individual topics of receptors within a chapter.

Topic	Definition
Marine Nature Conservation Sites*	The assessment of inter-related effects is central to the assessment of potential effects on the integrity of designated sites and has therefore already been assessed within the individual chapters of the Environmental Statement, and within the information to support the appropriate assessment. No additional levels of effect are therefore considered to occur at the site level beyond those identified in the topic specific chapters of the Environmental Statement and the information to support the appropriate assessment.
Climate Change	The assessment of inter-related effects is central to the assessment of potential effects on climate change and has therefore been assessed within Volume 2, Chapter 12: Climate change of the Environmental Statement and individual chapters as applicable. No additional levels of effects are therefore considered to occur beyond those identified in Volume 2, Chapter 12: Climate change of the Environmental Statement and individual chapters of the Environmental Statement.

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

- 15.5.2.6 Following the identification of receptor groups, the potential inter-related effects on those receptor groups were identified via review of the impact assessment sections for each topic chapter. The judgement as to which impacts may result in inter-related effects upon receptors associated with the Morgan Generation Assets was based on the professional judgement and experience of the project team.

#### **Linked receptor groups**

- 15.5.2.7 It is important to recognise potential linkages between the topic-specific chapters within this Environmental Statement, whereby effects assessed in each chapter have the potential for secondary effects on any number of other receptors. Examples include:
- Volume 2, Chapter 2: Benthic subtidal ecology of the Environmental Statement addresses effects on benthic habitats and species arising from potential changes to the physical environment (as described in Volume 2, Chapter 1: Physical processes of the Environmental Statement)
  - Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement addresses effects on fish and shellfish receptors arising from potential changes to the physical environment (as described in Volume 2, Chapter 1: Physical processes of the Environmental Statement) and

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colonisation of hard substrates (as described in Volume 2, Chapter 2: Benthic subtidal ecology of the Environmental Statement)

- Volume 2, Chapter 4: Marine mammals of the Environmental Statement assesses the effects on marine mammal receptors arising from potential changes to prey resources (as described in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement)
- Volume 2, Chapter 5: Offshore ornithology of the Environmental Statement assesses the effects on offshore ornithology receptors arising from potential changes to prey resources (as described in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement)
- Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement assesses the effects on commercial fisheries receptors arising from potential impacts on commercial species of fish and shellfish (as described in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement)
- Volume 2, Chapter 8: Marine archaeology and cultural heritage of the Environmental Statement assesses the effects on marine archaeology receptors arising from potential increases in suspended sediment concentrations (SSCs) and deposition and effects on sediment transport pathways (as described in Volume 2, Chapter 1: Physical processes of the Environmental Statement)
- Volume 2, Chapter 13: Socio-economics of the Environmental Statement assesses the effects on socio-economic receptors arising from potential impacts to shipping and navigation, other sea users and seascape, landscape and visual resources receptors (as described in Volume 2, Chapter 7: Shipping and navigation, Volume 2, Chapter 9: Other sea users and Volume 2, Chapter 10: Seascape, landscape and visual resources of the Environmental Statement)
- Volume 2, Chapter 14: Human health of the Environmental Statement assesses the effects on human health receptors arising from potential impacts to shipping and navigation, visual resources and socio-economic receptors (as described in Volume 2, Chapter 7: Shipping and navigation, Volume 2, Chapter 10: Seascape, landscape and visual resources and Volume 2, Chapter 13: Socio-economics of the Environmental Statement).

15.5.2.8 Where such linked relationships arise, these have been fully assessed within the individual topic chapters. This chapter on inter-related effects therefore summarises the consideration of these inter-related effects on linked receptors already set out in the preceding, topic-specific chapters.

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

15.5.2.9 Individual effects on each of the key receptors were identified 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 15.5. This information has been presented within the assessment tables in this chapter (see Table 15.6 to Table 15.18).

**Table 15.5: Definitions of project lifetime and receptor-led inter-related effects.**

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Effect type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Morgan Generation Assets (construction, operations and maintenance 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. underwater sound effects from construction piling, operational wind turbines, vessels and decommissioning).
Receptor-led effects	Assessment of the scope for multiple effects to interact to create inter-related effects on a receptor. As an example, multiple effects on a given receptor such as benthic habitats (e.g. direct habitat loss or disturbance, sediment plumes, scour, jack-up vessel use etc.) may interact to produce a different or 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.

15.5.2.10 The significance of the individual effects is presented in the summary of impacts, mitigation measures and monitoring tables for each receptor group within the topic-specific chapters (all conclusions for significance of effect for impacts defined in the topic chapters 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 is then undertaken (see Table 15.6 to Table 15.18). This assessment incorporates qualitative and, where reasonably possible, quantitative assessments. 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 chapter.

15.5.2.11 The inter-related effects assessment presents and utilises the maximum significant adverse effects for the project (i.e. the maximum design scenarios including successful implementation of mitigation measures where appropriate), noting that individual effects may not be significant at the topic-specific level but could become significant when their inter-related effect is assessed. Effects of negligible significance or greater (minor, moderate, major) may occur in only one phase of the project life cycle (e.g. during the construction phase but not the operations and maintenance or decommissioning phases). Where this is the case, it has been made clear that, as a result, there will be no inter-related effects across the project phases. Effects of negligible significance identified in the individual topic assessments have been included since there is the potential for inter-related effects to increase the level (significance) of effect when considered with other sources.

## 15.6 Assessment of inter-related effects

15.6.1.1 For each of the receptor groups listed above, the scope for impacts to these receptors to create project lifetime effects over all the project phases and/or receptor-led effects through interacting together on the receptor group in question has been explored and discussed in the following sections.

### 15.6.1 Physical environment

#### Physical processes

15.6.1.0 For physical processes, the following potential impacts have been considered within the inter-related assessment:



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- Increase in suspended sediments due to construction, operations and maintenance and/or decommissioning related activities and the potential impact to physical features
- Impacts to the tidal regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines
- Impacts to the wave regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines
- Impacts to sediment transport and sediment transport pathways due to presence of infrastructure and associated potential impacts to physical features and bathymetry.

15.6.1.1 The modelling studies undertaken for the Morgan Generation Assets detailed in Volume 4, Annex 1.1: Physical processes technical report of the Environmental Statement demonstrated that potential changes in physical processes do not extend into areas of temperature and salinity stratification located beyond the physical processes study area therefore there will be no impact on thermal stratification.

15.6.1.2 As previously noted, effects on physical processes also have the potential to have secondary effects on other receptors and these effects are fully considered in the topic-specific chapters. These receptors and effects are:

- Benthic subtidal ecology: Volume 2, Chapter 2: Benthic subtidal ecology of the Environmental Statement
  - Increased suspended sediment concentration
  - Sediment deposition.
- Fish and shellfish ecology: Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement
  - Increased suspended sediment concentration
  - Sediment deposition.

15.6.1.3 Table 15.6 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets, and also the inter-related effects (receptor-led effects that are predicted to arise for physical processes receptors).

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**Table 15.6: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – physical processes.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Increase in suspended sediments due to construction, operations and maintenance and/or decommissioning related activities, and the potential impact to physical features.	✓	✓	✓	<p>Increases in SSC during the construction phase would not extend into the operations and maintenance phase. Similarly, those increases which occur in the operations and maintenance phase due to maintenance activities would not extend to decommissioning.</p> <p>Across the project lifetime, the effects on physical processes 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Impacts to the tidal regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.	✓	✓	✓	<p>Changes to tidal regime, wave climate and sediment transport due to infrastructure relate to the same structures within the construction, operations and maintenance, and decommissioning phases. The decommissioning phase structures are those remaining seabed structures such as colonised scour protection when wind turbine structures have been removed, thus resulting in a lesser magnitude of the same impact.</p> <p>Across the project lifetime, the effects on physical processes 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Impacts to the wave regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.					
Impacts to sediment transport and sediment transport pathways due to presence of infrastructure and associated potential impacts to physical features and bathymetry.					

**Receptor-led effects**

West of Walney Marine Conservation Zone (MCZ) and West of Copeland MCZ: During principally the operations and maintenance phase, increased suspended sediment concentrations and associated deposition on physical features may occur due to maintenance activities; this would coincide with changes to tidal currents, wave climate, littoral currents and sediment transport due to the presence of the structures. Maintenance activities are sporadic, with the impacts predicted to be of local spatial extent, short term duration and intermittent. Within the West of Walney MCZ and the West of Copeland MCZ these impacts would be indistinguishable from background variations and would therefore not be significant in EIA terms.

## 15.6.2 Biological environment

### Benthic subtidal ecology

- 15.6.2.1 For benthic subtidal ecology, the following potential impacts have been considered within the inter-related assessment:
- Temporary and long term habitat loss/disturbance
  - Increased SSCs and associated sediment deposition
  - Disturbance/remobilisation of sediment-bound contaminants
  - Colonisation of hard substrate
  - Increased risk of introduction and spread of Invasive and Non-Native Species (INNS)
  - Removal of hard substrate
  - Changes in physical processes
  - EMFs from subsea electrical cabling
  - Heat from subsea electrical cabling.
- 15.6.2.2 Table 15.7 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for benthic ecology receptors.
- 15.6.2.3 As previously noted in paragraph 15.5.2.7, effects on benthic ecology also have the potential to have secondary effects on other receptors and these effects are fully considered in the topic-specific chapters. These receptors and effects are:
- Fish and shellfish ecology (Volume 2, Chapter 2: Fish and shellfish ecology of the Environmental Statement)
    - Colonisation of hard substrates.

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**Table 15.7: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – benthic ecology.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Temporary and long term habitat loss/disturbance.	✓	✓	✓	<p>The total area of habitat potentially affected, when disturbance and loss are considered additively across all phases, is greater than for each individual phase (e.g. just the construction phase). However, temporary habitat loss/disturbance arising during each phase of the Morgan Generation Assets will be highly localised to the vicinity of the activities being undertaken (i.e. limited to the immediate footprints) during each phase (i.e. construction, operations and maintenance, and decommissioning). Individual activities (e.g. jack-up activities, cable burial etc.) resulting in temporary habitat loss/disturbance will occur intermittently throughout this time with only a small proportion of the total area of habitat being impacted at any one time. The predominantly mixed sediment habitats present within the Morgan Array Area are typical of, and widespread throughout, the UK and in the east Irish Sea. All sediments and associated benthic communities are predicted to recover. Whilst there is the potential for repeat disturbance to occur during the operations and maintenance phase to habitats previously disturbed during the construction phase (e.g. as a result of jack-up activities and cable repair/reburial etc.) it is predicted that the benthic communities will have fully recovered from construction impacts by this time.</p> <p>Across the project lifetime, potential impacts from habitat disturbance events are localised in nature and the benthic communities are predicted to recover, limiting the potential for impacts to interact across the different phases. The effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Increased SSCs and associated sediment deposition.	✓	✓	✓	<p>Activities with the potential to result in the greatest level of seabed disturbance and, therefore, highest increases in SSC/deposition, will occur during the construction phase. Any effects on benthic communities during this time will be intermittent, temporary and short term. The benthic subtidal Important Ecological Features (IEFs) potentially affected by increased SSC and deposition are predicted to have recovered in the intervening period between phases (i.e. prior to any localised increases in SSC during maintenance activities in the operations and maintenance phase).</p> <p>Increases in SSC and sediment deposition during the operations and maintenance and decommissioning phases will be significantly lower than during the construction phase and also highly localised. Across the project lifetime, the effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement. This is because the benthic communities are predicted to have recovered from the construction phase impacts such that localised activities in the other project phases will not interact.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Disturbance/remobilisation of sediment-bound contaminants.	✓	✓	✓	<p>This impact is expected to occur in the construction, operations and maintenance, and decommissioning phases of the Morgan Generation Assets during activities that disturb seabed sediments. However, additive effects across the lifetime of the Morgan Generation Assets are considered highly unlikely on the basis of the physical processes modelling outputs which have shown that increases in SSC (and therefore associated contaminants) will be temporary, dispersed and diluted over a large area and will return to baseline within a few tidal cycles, as well as the low levels of contamination which were detected in the site-specific surveys. This is not predicted to result in any significant combined impact across phases greater than what has been assessed for each individual phase. For example, remobilisation as a result of construction activities will only result in low concentrations of sediment bound contaminants which, as noted above, will have been dispersed over a large area and therefore, they will not interact with potential contaminants released from operations and maintenance activities.</p> <p>Across the project lifetime, the effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement. This is because of the low levels of contaminants in sediments and that any resuspension will have been dispersed over a large area between disturbance events in different project phases such that they will not interact.</p>	No change resulting from inter-related assessment
Introduction of artificial structures.	✓	✓	✓	<p>This impact may occur throughout the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets. The communities that develop on the introduced hard structures will likely differ from the surrounding sedimentary biotopes but may be typical of areas of coarse and stony substrate in the area and is likely to result in an increase in biodiversity. Also, the amount of the hard infrastructure is expected to be consistent between the construction and operations and maintenance phases, and this will provide long-term stability to any communities which form. During the decommissioning phase the wind turbine and OSP foundations may be removed with cables and cable crossings potentially being left <i>in situ</i> after decommissioning, which will reduce the impacts to soft substrate benthic communities associated with the presence of artificial structures.</p> <p>Across the project lifetime, the effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement. In fact, the removal of infrastructure (i.e. foundations) will reduce the magnitude of this impact in the post-decommissioning phase.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Increased risk of introduction and spread of INNS.	✓	✓	✓	<p>Although the presence and movement of vessels may facilitate the introduction and spread of INNS across all phases of the Morgan Generation Assets, this effect will predominantly arise during the operations and maintenance phase, if it does occur. This is because, the presence of the hard substrate associated with the Morgan Generation Assets infrastructure (e.g. wind turbine foundations, scour protection and cable protection) will be present in the operations and maintenance phase which may provide INNS with the necessary substrate on which to settle. However, the measures adopted as part of the Morgan Generation Assets include the implementation of the Offshore Environmental Management Plan (EMP) with provisions for management of INNS. This will ensure that the risk of potential introduction and spread of INNS will be minimised across all phases. As a result, any additional inter-related effect is judged to be of minor significance in all phases of the Morgan Generation Assets (i.e. of no greater significance than those assessed for each individual phase).</p> <p>Across the project lifetime, the effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement. This is due to the measures adopted as part of the Morgan Generation Assets which will minimise the risk of introduction and spread of INNS and, furthermore, the foundations will be removed during the decommissioning phase.</p>	No change resulting from inter-related assessment
Removal of hard substrates.	×	×	✓	<p>This effect will only arise during the decommissioning phase. Across the project lifetime, the effects on benthic ecology receptors are therefore 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Changes in physical processes.	×	✓	✓	<p>Changes to physical processes due to infrastructure relate to the same structures within the operations and maintenance and decommissioning phases. The decommissioning phase structures are those remaining seabed structures such as colonised scour protection when wind turbine structures have been removed, thus resulting in a lesser magnitude of the same impact. Therefore, the magnitude and overall significance of this impact will reduce between phases.</p> <p>Across the project lifetime, the effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement. This is because the magnitude of this impact will reduce in the decommissioning phase with the removal of foundations.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
EMF from subsea electrical cabling.	x	✓	x	This effect will only arise during the operations and maintenance phase. Across the project lifetime, the effects on benthic ecology receptors are therefore 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment
Heat from subsea electrical cabling.	x	✓	x	This effect will only arise during the operations and maintenance phase. Across the project lifetime, the effects on benthic ecology receptors are therefore 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment

### Receptor-led effects

There is the potential for spatial and temporal interactions between the effects arising from habitat loss/disturbance, introduction of artificial structures, increased SSC and associated sediment deposition, resuspension of contaminants, changes in physical processes, EMF and heat on benthic habitats during the lifetime of the Morgan Generation Assets.

Based on current understanding, and expert knowledge, the greatest potential for inter-related impacts is predicted to arise through the interaction of direct (both temporary and long-term) habitat loss/disturbance from seabed preparation, foundation installation/jack-up/anchor placement/scour, indirect habitat disturbance due to sediment deposition and indirect effects of changes in physical processes due to the Morgan Generation Assets.

These individual impacts were assigned a significance of negligible to minor as individual impacts and although potential combined impacts may arise (i.e. spatial and temporal overlap of habitat disturbance), it is not predicted that this will result in effects of greater significance than the individual impacts in isolation. This is because the combined extent of habitat potentially affected would be typically restricted to the Morgan Generation Assets and wider Zone of Influence (Zol), the habitats affected are widespread across the UK and east Irish Sea and, where temporary disturbance occurs, full recovery of the benthos is predicted. In addition, any effects due to changes in the physical processes are likely to be limited, both in extent (i.e. largely within the Morgan Array Area) and also in magnitude, with benthic ecology receptors having low sensitivity or high recoverability to the scale of the changes predicted.

Across the project lifetime, the additive effects on benthic ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.

## Fish and shellfish ecology

- 15.6.2.4 For fish and shellfish ecology, the following potential impacts have been considered within the inter-related assessment:
- Temporary and long term habitat loss/disturbance
  - Underwater sound impacting fish and shellfish receptors
  - Increased SSCs and associated sediment deposition
  - EMFs from subsea electrical cabling
  - Introduction and colonisation of hard structures
  - Disturbance/remobilisation of sediment-bound contaminants
  - Injury due to increased risk of collision with vessels (basking shark only).
- 15.6.2.5 Table 15.8 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for fish and shellfish ecology receptors.
- 15.6.2.6 As previously noted in paragraph 15.5.2.7, effects on fish and shellfish ecology also have the potential to have secondary effects on other receptors and these effects are fully considered in the topic-specific chapters. These receptors and effects are:
- Marine mammals (Volume 2, Chapter 4: Marine mammals of the Environmental Statement)
    - Changes in fish and shellfish communities affecting prey availability.
  - Offshore Ornithology (Volume 2, Chapter 5: Offshore ornithology of the Environmental Statement)
    - Indirect impacts from underwater sound affecting prey species
    - Changes in fish and shellfish communities affecting prey availability.
  - Commercial fisheries (Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement)
    - Impacts on commercially important fish and shellfish resources.



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**Table 15.8: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – fish and shellfish ecology.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Temporary and long term habitat loss/disturbance.	✓	✓	✓	<p>When subtidal habitat loss (temporary and long term) is considered additively across all phases of the Morgan Generation Assets, the total area of habitat affected is larger than for the individual project stages. However, similar habitats are widespread across the fish and shellfish ecology study area and the wider Irish Sea and the impact will therefore be proportionally small in this context.</p> <p>During the operations and maintenance phase, most of the disturbance will be highly localised, and the habitats affected are predicted to recover quickly following completion of maintenance activities with fish and shellfish IEFs recovering into the affected areas. Also, many operations and maintenance activities will be located in the same areas affected during construction (e.g. jack up operations adjacent to wind turbine foundations, or reburial of exposed cables).</p> <p>Decommissioning will also be impacting the same locations, to a lesser degree than during construction.</p> <p>Therefore, across the project lifetime, the potential effects on fish and shellfish IEFs 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.</p>	No change resulting from inter-related assessment
Underwater sound impacting fish and shellfish receptors.	✓	×	×	<p>The impact of underwater sound from piling and UXO clearance will only arise during the construction phase and as such there will be no interaction effects across the project phases. Geophysical surveys are only considered during the construction phase alongside other sound-producing activities due the negligible effects on fish and shellfish receptors when considered as standalone activities, and therefore no interaction effects are predicted across project phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Increased suspended SSCs and associated sediment deposition.	✓	✓	✓	<p>Most of the seabed disturbance (resulting in highest SSC/deposition) will occur during the construction and decommissioning phases, with minor increases in SSC/deposition during the operations and maintenance phase. IEFs and associated spawning/nursery habitats potentially affected by increased SSC and deposition will recover quickly following impact exposure such that there will be no inter-related effects across the construction, operations and maintenance and decommissioning phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
EMFs from subsea electrical cabling.	×	✓	×	<p>This effect will only arise during the operations and maintenance phase and as such there will be no interaction effects across the project phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Introduction and colonisation of hard structures.	✓	✓	✓	<p>This impact will occur throughout all phases of the Morgan Generation Assets, with the expected development of hard substrate communities throughout the lifetime of the infrastructure. These communities will differ from the surrounding sedimentary biotopes but are unlikely to represent a significant decrease in biodiversity. Also, much of the hard infrastructure is expected to be left in place following decommissioning (except wind turbine and OSP foundations), and this will provide long-term stability to any communities which form. Therefore, across the project lifetime, the effects on fish and shellfish IEFs 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.</p>	No change resulting from inter-related assessment
Remobilisation of sediment bound contaminants.	✓	✓	✓	<p>This impact is expected to occur in the construction, operations and maintenance, and decommissioning phases of the Morgan Generation Assets during activities that disturb seabed sediments. However, additive effects across the lifetime of the Morgan Generation Assets are considered highly unlikely on the basis of the physical processes modelling outputs which have shown that increases in SSC (and therefore associated contaminants) will be temporary, dispersed and diluted over a large area and will return to baseline within a few tidal cycles, as well as the low levels of contamination which were detected in the site-specific surveys. This is not predicted to result in any significant combined impact across phases greater than what has been assessed for each individual phase. For example, remobilisation as a result of construction activities will only result in low concentrations of sediment bound contaminants which, as noted above, will have been dispersed over a large area and therefore, they will not interact with potential contaminants released from operations and maintenance activities.</p> <p>It is predicted that IEFs and associated spawning/nursery habitats potentially affected by remobilisation of sediment bound contaminants will recover quickly following impact exposure such that there will be no inter-related effects across the construction, operations and maintenance and decommissioning phases. Therefore, across the project lifetime, the effects on fish and shellfish IEFs 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.</p>	No change resulting from inter-related assessment
Injury due to increased risk of collision with vessels (basking shark only).	✓	✓	✓	<p>This impact is unlikely to have any additive effect across the three phases of the Morgan Generation Assets, due to the implementation of provisions for vessels and vessel movements within the Offshore EMP to be followed by every vessel engaged in the project to avoid collisions where possible. Should any collisions occur, the impact will be limited to that phase of activity, and evidence exists to suggest long-term survivability of basking shark in the event of collisions.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				Across the project lifetime, the effects on fish and shellfish ecology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	

### Receptor-led effects

Potential exists for spatial and temporal interactions between habitat loss or disturbance, underwater sound, increased SSC/deposition, introduction and colonisation of hard structures, EMF effects, disturbance and remobilisation of sediment-bound contaminants and injury to basking shark from vessel collisions during the lifetime of the Morgan Generation Assets.

Based on current understanding, and expert knowledge, the greatest scope for potential interaction impacts is predicted to arise through the interaction of habitat loss (temporary and long term), increased SSC, underwater sound from piling during the construction phase, and EMF effects during the operations and maintenance phase.

Except for the impact of piling sound on herring which was predicted to potentially result in a moderate adverse effect during the Douglas Bank Manx herring stock spawning period of late September for three to four weeks during the construction phase only, these individual impacts were assigned a significance of negligible to minor adverse as standalone impacts and although potential combined impacts may arise (e.g. through increases in SSCs and associated deposition and the disturbance and remobilisation of sediment bound contaminants which are likely to co-occur, although the potential for effects associated with remobilising sediment bound contaminants is negligible based upon the in situ contaminants data collected), it is important to recognise that some of the activities potentially resulting in combined effects are mutually exclusive. Further, where activities may co-occur, the impacts of each activity are typically specific to particular species or species groups and their behaviour or lifecycle stage (e.g. spawning of herring, sandeel habitation and spawning, migration of diadromous fish). For example, most potential effects associated with an increase in SSC/deposition will arise from seabed preparation and sandwave clearance works and the installation of the Morgan Generation Assets inter-array and interconnector cables, whereas most sound effects will arise from foundation piling undertaken at a different time. In addition, these impacts will be temporary and reversible following cessation of construction or decommissioning, with fish and shellfish communities expected to recover. Furthermore, underwater sound from piling operations is predicted to result in the displacement of mobile fish from areas around foundations which in turn will mean that these species will not be exposed to the greatest predicted increases in SSC. It should also be noted that there will be no temporal overlap of elevated sound production between piling of foundations, UXO clearance or geophysical survey acquisition, therefore these activities are considered exclusive to one another and are not expected to generate any interactive effects. Any potential behavioural effects as a result of EMF would be likely to occur over the same area as habitat loss/change effects (i.e. within metres of the cables) and therefore habitat loss effects would not be additive to EMF effects. There may be localised changes in fish and shellfish communities in the areas affected by long term habitat loss, due to potential changes in substrate type and foraging opportunities, and potential behavioural effects associated with EMF. Any shifts in baseline assemblage will be limited to these areas and, therefore, effects of greater significance than the individual impacts in isolation (i.e. negligible to moderate) are not predicted.

Overall, the evidence presented in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement indicates that impacts on fish and shellfish receptors from construction operations (particularly piling) are temporary and reversible and that fish and shellfish communities are not significantly adversely affected by the presence of operational wind farms and therefore additive effects across impacts and phases are not expected to occur. Additional measures under consideration to manage underwater sound effects during piling of foundations in the construction phase are presented in the Outline Underwater Sound Management Strategy (Document Reference J13) and will be finalised post-consent with input and agreement from relevant stakeholders.

## **Marine mammals**

- 15.6.2.7 For marine mammals, the following potential impacts have been considered within the inter-related assessment:
- Injury and disturbance from elevated underwater sound during piling
  - Injury and disturbance from elevated underwater sound generated from site investigation survey sources
  - Injury and disturbance from elevated underwater sound during unexploded ordnance (UXO) clearance
  - Injury and disturbance from elevated underwater sound due to vessel use and other (non-piling) sound producing activities
  - Increased likelihood of injury due to collision with vessels
  - Underwater sound from wind turbine operation
  - Changes in fish and shellfish communities affecting prey availability.
- 15.6.2.8 Table 15.9 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for marine mammal receptors.
- 15.6.2.9 As previously noted, marine mammals and fish and shellfish ecology are linked receptor groups and the inter-related effects associated with a change in the distribution and/or abundance of prey species for marine mammals across each phase of the project has been fully assessed in Volume 2, Chapter 4: Marine mammals of the Environmental Statement.

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**Table 15.9: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – marine mammals.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Injury and disturbance from elevated underwater sound during piling.	✓	✗	✗	<p>The impact of elevated underwater sound during piling will only arise during the construction phase. As such there will be no pathway for inter-related effects across the project phases of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound generated from site investigation survey sources.	✓	✗	✗	<p>The impact of elevated underwater sound generated from site investigation survey sources will only arise during the construction phase. As such there will be no pathway for inter-related effects across the project phases of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound during UXO clearance.	✓	✗	✗	<p>The impact of elevated underwater sound during UXO clearance will only arise during the construction phase. As such there will be no pathway for inter-related effects across the project phases of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound due to vessel use and other (non-piling) sound producing activities.	✓	✓	✓	<p>Vessels will be used throughout all phases of the Morgan Generation Assets and therefore the impact of injury and disturbance to marine mammals from elevated underwater sound due to vessel use and other (non-piling) sound producing activities throughout all phases could cause additional disturbance to marine mammals compared to considering each stage separately. However, for all phases, vessel movements will primarily be located within the Morgan Array Area and travelling at a speed slower than 14 knots, which is anticipated to reduce disturbance effects (evidenced by slowdown trial undertaken by Joy <i>et al.</i> (2019) which achieved 22% reduction in 'potential lost foraging time' for killer whales (with 40% reductions when 100% of vessels were under the 11 knot speed limit)). Vessels will also</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				<p>follow the measures to minimise disturbance to marine mammals within the Offshore EMP. For other activities, drilling (foundation installation) will only occur during the construction phase, and cable trenching/laying will predominantly take place during the construction phase and to a more limited extent during the operations and maintenance phase (cable repair).</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	
Increased likelihood of injury due to collision with vessels.	✓	✓	✓	<p>Over the lifetime of the Morgan Generation Assets there will be an ongoing risk of collision associated with vessel activity throughout all phases. If injury to marine mammals from collisions did occur this could lead to loss of individuals and potentially have an effect at the population-level, particularly for species with smaller populations, such as bottlenose dolphin and harbour seal. However, there is a high likelihood that marine mammals will avoid vessels, as they will likely be disturbed by underwater sound from the vessel, thereby reducing collision risk. In addition, the risk of collisions will be further reduced through the implementation of an Offshore EMP with provisions for vessels and vessel movements, including vessel transit corridors to minimise the potential for collision risk.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Underwater sound from wind turbine operation.	✗	✓	✗	<p>The impact of underwater sound from wind turbine operation will only arise during the operations and maintenance phase. As such there will be no pathway for inter-related effects across the project phases of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Changes in fish and shellfish communities affecting prey availability.	✓	✓	✓	<p>Fish and shellfish communities may be impacted through all phases of the Morgan Generation Assets and therefore could present a long-term effect on marine mammals through changes to prey availability. Potential effects on fish and shellfish receptors are described in detail in Volume 2, Chapter 8: Fish and shellfish of the Environmental Statement. For all potential impacts and at all phases of the Morgan Generation Assets the effects were, however, predicted to be very localised and unlikely to lead to significant</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				<p>effects on marine mammals. Even in the context of longer-term impacts there is unlikely to be an additive effect as marine mammals can exploit a suite of prey species and only a small area will be affected when compared to available foraging habitat in the east Irish Sea.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	

### Receptor-led effects

There is the potential for spatial and temporal interactions between the effects arising from elevated underwater sound (due to piling, UXO clearance, site investigation surveys, and vessel use and other (non-piling) sound producing activities), collision risk with vessels and changes in prey availability during the lifetime of the Morgan Generation Assets.

Based on current understanding and expert knowledge, the greatest potential for inter-related effects is predicted to arise through the interaction of injury and disturbance from elevated underwater sound during piling, elevated underwater sound during UXO clearance, elevated underwater sound due to vessel use and other (non-piling) sound producing activities and elevated underwater sound generated during site investigation survey sources, due to the Morgan Generation Assets.

Except for the impact of UXO clearance for harbour porpoise only (which was given a moderate adverse significance, for auditory injury only), these impacts were assigned a significance of minor as individual impacts. Whilst potential overlap of effects may arise (e.g. spatial and temporal overlap of sound impacts from elevated underwater sound due to vessel use and other (non-piling) sound producing activities with other sound impacts) it is not predicted that these will result in effects of greater significance than the individual impacts in isolation.

Firstly, there will be no temporal overlap between the impacts of injury and disturbance from elevated underwater sound during piling, elevated underwater sound during UXO clearance and elevated underwater sound generated during site investigation survey sources; UXO clearance and site investigation surveys will be carried out in advance of construction activities (piling) and UXO clearance will not temporally overlap with site investigation surveys due to safety and operational reasons.

Whilst the impact of injury and disturbance from elevated underwater sound due to vessel use and other (non-piling) sound producing activities will overlap temporally with other sound producing activities across all phases of the Morgan Generation Assets, and there may be some overlap of ensonification, all individuals are assumed to be disturbed if within range and excluded from the greatest disturbance footprint. Similarly there is unlikely to be any inter-related effect of vessel collision and sound impacts, as those animals excluded from disturbance footprints will also be excluded from potential collision risk zones. As such, there will unlikely be a pathway to inter-related effects.

Additionally, sound impacts have the potential to temporally overlap with the impact of changes in fish and shellfish communities affecting prey availability across all phases of the Morgan Generation Assets. However, as above, all individuals are assumed to be disturbed by sound impacts if within range, and excluded from the greatest disturbance footprint. Therefore, if an animal is excluded from the area, no inter-related effect is likely. In addition, any effects on prey species will likely be offset, on the basis that, as marine mammals are temporarily displaced from areas around sound impacts, many prey species that form part of their diet will also be temporarily displaced. Furthermore, once sound impacts have ceased any changes to prey availability will be highly localised, and therefore there will unlikely be a pathway to inter-related effects.

Overall, it is not predicted that these inter-related impacts will result in effects of greater significance than the individual impacts in isolation. Whilst individual impacts could add to the overall duration of elevated underwater sound spatially, the extent of sound disturbance will be restricted to the Morgan Generation Assets and the extent of the

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
<p>largest ZoI (i.e. piling). The greatest extent of disturbance is considered to be as a result of construction activities, and once constructions activities have ceased, all further impacts are expected to be localised and largely intermittent, and therefore, over the extent of the Morgan Generation Assets lifetime, (as stated above) it is not predicted that these will result in effects of greater significance than the individual impacts in isolation.</p> <p>With the implementation of the Marine Mammal Mitigation Protocol (Document Reference J17) (which aims to reduce the likelihood of any significant impacts, such as injury to harbour porpoise from UXO clearance) and adherence to the Underwater Sound Management Strategy (Document Reference J13), Permanent Threshold Shift is not predicted to occur in any marine mammal species and Temporary Threshold Shift is a recoverable impact. It is therefore predicted that there would be no inter-related effect with respect to injury to marine mammal IEFs. With respect to disturbance, the potential for spatially inter-related effects is considered to be minimal as individual animals are likely to be disturbed over a range dictated by the 'loudest' sound (i.e. leading to the greatest disturbance range) such that the potential for secondary (additive) effects from other activities that result in smaller ranges is reduced, as animals are already disturbed and have moved away from the area of highest ensonification. Temporally, animals may return to the area between sound generating activities leading to repeated exposure to sound over extended duration, however it is not predicted that this will result in effects of greater significance than the individual impacts in isolation due to intervals between activities.</p> <p>Across the project lifetime, the effects on marine mammal 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>					



### Offshore ornithology

- 15.6.2.10 For offshore ornithology, the following potential impacts have been considered within the inter-related assessment:
- Disturbance and displacement from airborne sound, underwater sound, and presence of vessels and infrastructure
  - Indirect impacts from underwater sound affecting prey species
  - Temporary habitat loss/disturbance and increased SSCs
  - Collision risk
  - Barrier to movement
  - Combined displacement and collision risk.
- 15.6.2.11 Table 15.10 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for offshore ornithology receptors.
- 15.6.2.12 As previously noted in paragraph 15.5.2.7, ornithological receptors and fish and shellfish receptors are linked and the inter-related effects associated with a change to the prey resources of ornithological receptors has been fully assessed in Volume 2, Chapter 5: Offshore ornithology of the Environmental Statement.

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**Table 15.10: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – offshore ornithology.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Disturbance and displacement from airborne sound, underwater sound, and presence of vessels and infrastructure.	✓	✓	✓	<p>The impact of disturbance and displacement caused by construction activities and associated vessel movements is predicted to be negligible adverse for all species, which is not significant in EIA terms. In addition, with implementation of the measures adopted as part of the Morgan Generation Assets, the risk of disturbance will be further reduced through an Offshore EMP which includes provisions for vessels and vessel transit corridors to minimise the potential for disturbance. The birds disturbed during the construction phase are expected to return as soon as the specific and locally active works are completed. Although the shorter construction period has a displacement impact of lower magnitude than during the operations and maintenance phase, it slightly extends the period over which displacement impacts may occur overall.</p> <p>During the operations and maintenance phase, the presence of operational wind turbines has the potential to directly disturb guillemot, razorbill, gannet, kittiwake and Manx shearwater leading to displacement from the Morgan Generation Assets including an area of variable size or buffer (depending on species' sensitivity) around it. This effect was predicted to be of negligible significance for all species.</p> <p>Whilst the operations and maintenance phase will feature a much-reduced level of boat activity in comparison to the construction phase, the decommissioning phase will require similar number of vessels to the construction phase. The effects of decommissioning activities are expected to be similar in magnitude to those arising from construction. Like the construction phase, the decommissioning phase has a displacement impact of lower magnitude than during the operations and maintenance phase. Yet, it slightly extends the period over which displacement impacts may occur during the lifetime of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on offshore ornithology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Indirect impacts from underwater sound affecting prey species.	✓	×	✓	<p>Indirect impacts caused by a change in prey species (e.g. cod, sprat, herring and sandeel) during the construction and decommissioning phases are predicted to be negligible adverse for relevant receptor species, which is not significant in EIA terms. There will be no inter-related effects between the construction and decommissioning phases which do not overlap. Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments</p>	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				presented for each individual phase or when considered in conjunction with other topics addressed in the Environmental Statement.	
Temporary habitat loss/disturbance and increased suspended sediment concentrations (SSCs).	✓	✓	✓	<p>During the construction and decommissioning phases, seabirds may be indirectly disturbed and displaced as a result of direct impacts on habitat and increased SSCs, which may result in the loss of a food resource to birds in the Morgan Array Area. This will lead to temporary habitat disturbance at a local scale.</p> <p>During the operations and maintenance phase, activities within the Morgan Array Area may lead to increases in SSCs and associated sediment deposition. The magnitude of the impacts would be a small fraction of those quantified for the construction and decommissioning phases. The prey species and habitats potentially affected by construction and decommissioning activities are likely to recover during the operations and maintenance phase.</p> <p>Across the project lifetime, the effects on offshore ornithology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Collision risk.	×	✓	×	<p>During the operations and maintenance phase, the presence of operational wind turbines has the potential to present a collision risk to kittiwake, great black-backed gull, herring gull, great skua, European storm petrel, Leach's petrel, fulmar, Manx shearwater, gannet and migratory waterbirds. This impact is predicted to be of negligible to minor adverse significance for these species. This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the project lifetime, the effects on offshore ornithology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Barrier to movement.	×	✓	×	<p>Barrier effects may arise in addition to displacement, though this is predicted to be negligible adverse for all receptors, which is not significant in EIA terms. This effect will only arise during the operations and maintenance phase, therefore there will be no inter-related effects across the project phases of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on offshore ornithology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		

**Receptor-led effects**

Potential exists for spatial and temporal interactions between disturbance and displacement, and indirect disturbance and displacement resulting from changes to prey species and habitats during the lifetime of the Morgan Generation Assets.

Based on current understanding and expert knowledge, the greatest scope for potential interaction impacts is predicted to arise through the following:

- Combined disturbance, displacement and changes in prey species during the construction phase
- Combined collision risk, displacement and barrier effects during the operations and maintenance phase.

Combined disturbance, displacement and changes in prey species during the construction phase: Individual impacts were assigned a significance of negligible to minor adverse as standalone impacts. Although potential combined impacts may arise, it is essential to acknowledge that some of the activities potentially resulting in combined effects would not be additive. For instance, the displacement effect on seabirds is expected to be very localised, intermittent and of short duration during the construction phase. Prey availability and habitats may also be altered during the construction phase, leading to the redistribution of birds. In this scenario, the inter-related effects are expected to cancel each other out to a degree: a redistribution of prey due to indirect disturbance/displacement will reduce the direct displacement effect of seabirds caused by construction activities. Compounding inter-related effects will only occur if seabirds continue to use the site where prey have been displaced from.

Combined collision risk, displacement and barrier effects during the operations and maintenance phase: Individual impacts were assigned a significance of negligible to minor as standalone impacts and although potential combined impacts may arise, it is important to recognise that some of the activities potentially resulting in combined effects are mutually exclusive. Species cannot simultaneously exhibit a high level of avoidance (displacement effect) and a high level of collision risk (collision effect). Furthermore, there are differences in the species' susceptibility to the collision and displacement effects. Typically, species that forage on the wing (e.g. surface feeders such as gull species) will be more susceptible to collision risk and less affected by displacement as they move quickly between feeding opportunities – thus more likely to fly within rotor height. In contrast, sub-surface feeders and in particular species diving at great depths (e.g. auks) would be more susceptible to displacement/disturbance: they feed for a prolonged period of time and fly less frequently between feeding patches, and thus at much-reduced level of collision risk. Two species were assessed for the combined impact of displacement and collision risk during the operations and maintenance phase: kittiwake and gannet. For both of these species, the combined impact was of minor adverse significance, which is not significant in EIA terms.

## 15.6.3 Human environment

### Commercial fisheries

- 15.6.3.1 For commercial fisheries, the following potential impacts have been considered within the inter-related assessment:
- Loss or restricted access to fishing grounds
  - Displacement of fishing activity into other areas
  - Interference with fishing activity
  - Temporary increase in steaming distances
  - Loss or damage to fishing gear due to snagging
  - Potential impacts on commercially important fish and shellfish resources
  - Supply chain opportunities for local fishing vessels
  - Potential impacts on commercial fisheries as a result of increased risk of introduction and spread of INNS.
- 15.6.3.2 Table 15.11 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for commercial fisheries receptors.
- 15.6.3.3 As previously noted in paragraph 15.5.2.7, commercial fisheries receptors and fish and shellfish receptors are linked and the inter-related effects associated with potential impacts on commercially important fish and shellfish species has been fully assessed in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement, with effects of minor adverse significance predicted for all project phases following mitigation.

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**Table 15.11: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – commercial fisheries.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Loss or restricted access to fishing grounds.	✓	✓	✓	<p>During the construction and decommissioning phases of the Morgan Generation Assets, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. The commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded that during the construction and decommissioning phases an effect of negligible significance for all receptor groups, with the exception of Scottish west coast scallop vessels and Isle of Man scallop vessels where an effect of minor adverse significance is predicted, which is not significant in EIA terms. During construction, for example, fishing will be excluded from 500 m safety zones around vessels installing wind turbines and OSPs and their associated foundations. Rolling advisory clearance distances of 500 m will also be present around vessels installing inter-array cables and interconnector cables. Temporary restrictions to fishing activity and/or anchoring will also be required in areas where full cable burial to target depth has not yet been achieved and/or surface-laid cable exists (prior to cover by external cable protection). In such areas of temporarily shallow-buried/surface-laid cable, the restricted areas may be monitored by guard vessels as required (as outlined and secured within the outline Fisheries Liaison and Co-existence Plan (FLCP), Document Reference J10).</p> <p>During the operations and maintenance phase, all commercial fisheries receptor groups will be able to continue fishing within the Morgan Array Area. The commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded that during the operations and maintenance phase, an effect of negligible significance for all receptor groups, with the exception of Scottish west coast scallop vessels where an effect of minor adverse significance is predicted, which is not significant in EIA terms. To mitigate the potential for project infrastructure to severely restrict fishing and to promote co-existence and co-location, the Applicant has made a commitment to maintaining an area free of wind turbines and OSPs over an area of core scallop grounds within the Morgan Array Area, termed the Scallop Mitigation Zone (SMZ). Project-specific consultation has established that scallop and static gear vessels tow and deploy their gear in a north to south alignment within the Morgan Array Area, which is the only orientation possible due to tides in the region. The Applicant has also committed to positioning wind turbine rows in a roughly north to south alignment, to allow for continued fishing within the Morgan Array Area (secured within the Outline FLCP, Document Reference: J10).</p> <p>While there will be a small incremental increase in the area in which fishing may be disrupted as the Morgan Generation Assets are built out, as fishing activity is likely to be able to continue</p>	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				elsewhere during all project phases, effects on commercial fisheries across the phases 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	
Displacement of fishing activity into other areas.	✓	✓	✓	<p>During all phases of the Morgan Generation Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded a negligible significance of effect for all receptor groups.</p> <p>The Applicant has made a number of commitments to mitigate the potential for the Morgan Generation Assets to severely restrict fishing and displace fishing activity into other areas, and to promote co-existence and co-location. All commitments are outlined and secured within the Outline FLCP (Document Reference J10).</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Interference with fishing activity.	✓	✓	✓	<p>During all phases of the Morgan Generation Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded a negligible significance of effect for all receptor groups, with the exception of offshore static gear vessels where an effect of minor adverse significance is predicted, which is not significant in EIA terms.</p> <p>Smaller vessel sizes associated with offshore static gear vessel receptor groups may be affected by the presence of vessels during the construction and decommissioning phases within the Morgan Array Area. The marker buoys and actual gear deployed by static gear vessels are vulnerable to potential interference by construction vessels, due to their poor visibility. Although operations and maintenance vessel traffic will add to the existing level of shipping activity in the area, there are already moderate levels of vessel traffic in the area and there is co-existence of fishing vessels with other marine traffic.</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Temporary increase in steaming distances.	✓	✗	✓	<p>During the construction and the decommissioning phases of the Morgan Generation Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded a negligible significance of effect for all receptor groups.</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Loss or damage to fishing gear due to snagging.	✓	✓	✓	<p>During all phases of the Morgan Generation Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement concluded a negligible significance of effect for all receptor groups, with the exception of Scottish west coast scallop vessels where an effect of minor adverse significance is predicted, which is not significant in EIA terms.</p> <p>The construction, operations and maintenance and decommissioning of the Morgan Array Area may lead to loss or damage to fishing gear due to snagging. Snagging risks may occur as a result of infrastructure on the seabed, such as inter-array cables and associated cable protection.</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Potential impacts on commercially important fish and shellfish resources.	✓	✓	✓	<p>Impacts to prey species (i.e. fish and shellfish) will be at their maximum during the construction phase as a result of effects associated with underwater sound from piling, increased suspended sediments and habitat loss. The fish and shellfish ecology assessment presented in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement concluded that the only significant effect to commercially important fish and shellfish species would be to herring during the construction phase of the Morgan Generation Assets. This is as a result of underwater sound generated by piling during the herring spawning period. A significant impact is therefore predicted for the herring vessels receptor group. This would be offset by the tertiary mitigation proposed in the form of development of an Underwater Sound Management Strategy (Document Reference: J13). This strategy is proposed to be developed with stakeholder input post-consent and will be used to define appropriate measures to reduce the magnitude of effect to environmentally acceptable levels (in this case, negligible or low). With the implementation of such a plan, the residual significance of effect to herring is anticipated to be minor adverse, which is not significant in EIA terms.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the</p>	No change resulting from inter-related assessment.



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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				assessments presented for each individual phase or when considered in conjunction with other topics addressed in the Environmental Statement.	
Supply chain opportunities for local fishing vessels.	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases within the Morgan Array Area, there may be the opportunity for commercial fisheries operators to provide support to the Morgan Generation Assets, such as guard vessels and scouting surveys.</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Potential impacts on commercial fisheries as a result of increased risk of introduction and spread of INNS.	✓	✓	✓	<p>As assessed in Volume 2, Chapter 7: Benthic subtidal ecology of the Environmental Statement, no significant effects are likely to occur as a result of the risk of introduction and spread of INNS during the construction, operations and maintenance and decommissioning phases.</p> <p>Across the project lifetime, the effects on commercial fisheries 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.

**Receptor-led effects**

There is potential for an inter-related effect from the combination of supply chain benefits for local fishing vessels and reduction in loss or restricted access to fishing grounds; this is because fishing vessels are likely to be providing marine operational support during periods of construction or major maintenance works which would have resulted in a loss or restricted access to fishing grounds if the vessel had not been providing support to the Morgan Generation Assets. This means that the benefit to the local fishing vessels, as a result of the supply chain opportunities is acting more as an alleviation of potential losses than an additional benefit. It is therefore predicted that any potential inter-related effect will reduce the beneficial significance of supply chain opportunities, which would result in a negligible beneficial significance.

There is potential for an inter-related effect from the combination of the loss or restricted access to fishing grounds and the consequent displacement of fishing activity into other areas. This could result in increased gear conflict and pressure on other fishing grounds. During construction, static gear vessels may be required to relocate pots from areas of activity, which could increase intensity of activity in other areas or cause conflict with mobile gear species (e.g. scallop vessels). However, with successful implementation of the measures outlined in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement, and the temporary nature of the works, it is not predicted that there will be any inter-related effect of greater significance than those already assessed in isolation.

### Shipping and navigation

- 15.6.3.4 For shipping and navigation, the following potential impacts have been considered within the inter-related assessment:
- Displacement/interference of fishing activity
  - Collision and allision risk of fishing vessels
  - Interference with oil and gas activities
  - Impact on emergency response capability
  - Impact on marine navigation, communications and positioning systems.
- 15.6.3.5 Table 15.12 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for shipping and navigation receptors.

As previously noted in paragraph 15.5.2.7, effects on shipping and navigation have the potential to have secondary effects on socio-economics and human health receptors and the inter-related effects have been fully assessed in Volume 2, Chapter 13: Socio-economics of the Environmental Statement and Volume 2, Chapter 14: Human health of the Environmental Statement.

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**Table 15.12: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – shipping and navigation.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related Significance
	C	O	D		
Displacement/interference of fishing activity.	✓	✓	✓	Displacement of fishing activity due to the presence of the Morgan Generation Assets and avoidance of other vessels has been assessed in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement. The Navigational Risk Assessment (NRA) supporting Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Therefore across the project lifetime, the effects on shipping and navigation 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.
Collision and allision risk of fishing vessels.	✓	✓	✓	Displacement of fishing activity due to the presence of the Morgan Generation Assets increases the risk of collision or allision of fishing vessels. This has been assessed within Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement with further details on fishing activity provided in Volume 2, Chapter 6: Commercial fisheries of the Environmental Statement. The NRA supporting Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Therefore across the project lifetime, the effects on shipping and navigation 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.
Interference with oil and gas activities.	✓	✓	✓	The NRA supporting Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Therefore across the project lifetime, the effects on shipping and navigation 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related Significance
	C	O	D		
Impact on emergency response capability.	✓	✓	✓	The NRA supporting Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Therefore across the project lifetime, the effects on shipping and navigation 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.
Impact on marine navigation, communications position fixing equipment.	✓	✓	✓	The NRA supporting Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Therefore across the project lifetime, the effects on shipping and navigation 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.

**Receptor-led effects**

The presence of the buoyed construction and decommissioning areas during the construction and decommissioning phases, respectively, may result in the displacement from fishing grounds of commercial fishing vessels. This displacement and the associated reduction in available sea room will increase the vessel to vessel collision risk between third-party vessels. However, it is unlikely that effects will act together and that any interactions between effects will be of any greater significance than those already assessed for the Morgan Generation Assets individually.

### Aviation and radar

- 15.6.3.6 For aviation and radar, the following potential impacts have been considered within the inter-related assessment:
- Creation of a physical obstacle to aircraft operations
  - Wind turbines causing interference on aviation primary surveillance radar systems.
- 15.6.3.7 Table 15.13 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for aviation and radar receptors.
- 15.6.3.8 Aviation and radar receptors and other sea users receptors are linked receptors and the inter-related effects (i.e. restriction on access to infrastructure by both helicopter and vessel) are described in Table 15.5.

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**Table 15.13: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – aviation and radar.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Creation of a physical obstacle to aircraft operations.	✓	✓	✓	<p>The individual standalone impacts were assigned minor adverse significance for military and low flying operations, minor adverse significance for helicopter operations, and minor adverse significance for instrument flight procedures after technical mitigation.</p> <p>Due to the measures adopted as part of the Morgan Generation Assets, including development of and adherence to a Design Plan, lighting and marking, notifications to aviation stakeholders and/or implementation of further mitigation, 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Wind turbines causing interference to aviation primary surveillance radar systems.	×	✓	×	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment

**Receptor-led effects**

Potential exists for spatial and temporal interactions between direct impacts to offshore energy operators as aviation and radar receptors and other sea users receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise from the following:

- Creation of a physical obstacle to aircraft operations – helicopter operations
- Reduction or restriction of other offshore energy activities (Volume 2, Chapter 9: Other sea users of the Environmental Statement).

There is potential for both helicopter and vessel access to existing and future offshore hydrocarbon infrastructure to be restricted by the presence of the Morgan Generation Assets. Restriction of access for helicopters operating in support of the offshore hydrocarbon industry has been assessed as being of minor adverse significance. Restriction of vessel access to existing offshore energy assets has been assessed as being of minor adverse significance (see Volume 2, Chapter 9: Other sea users of the Environmental Statement). Continued communication with other offshore energy operators will ensure relevant parties are kept informed of planned activities in order to minimise both spatial and temporal interactions between conflicting activities and maximise coexistence. Therefore, the significance of these combined effects on offshore energy operators will not be of any greater significance than the effects when assessed in isolation.

### Marine archaeology and cultural heritage

- 15.6.3.9 For marine archaeology and cultural heritage, the following potential impacts have been considered within the inter-related assessment:
- Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors
  - Alteration of sediment transport regimes
  - Potential impacts and effects arising from changes within the settings of terrestrial designated historic assets.
- 15.6.3.10 Table 15.14 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for marine archaeology and cultural heritage receptors.
- 15.6.3.11 As the only impacts and effects that will affect terrestrial designated assets will occur through alteration of their settings, and considering the distance between the Morgan Generation Assets and those designated assets, only visual impacts have the potential to alter those settings. That potential has been fully explored in both Volume 2, Chapter 8: Marine archaeology and cultural heritage of the Environmental Statement and Volume 4, Annex 8.2: Cultural heritage assessment of the Environmental Statement, and all potential effects described. Consequently, no inter-related effects are predicted to arise as a consequence of the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets.
- 15.6.3.12 As previously noted in paragraph 15.5.2.7, marine archaeology and physical processes (i.e. sediment deposition) are linked receptors and the inter-related effects associated with a change to marine archaeological receptors has been fully assessed in Volume 2, Chapter 8: Marine archaeology and cultural heritage of the Environmental Statement.

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**Table 15.14: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – marine archaeology and cultural heritage.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	<p>The construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.</p> <p>The measures adopted as part of the Morgan Generation Assets, described in Volume 2, Chapter 8: Marine archaeology and cultural heritage of the Environmental Statement, include implementation and adherence to an Outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) (Document Reference J14) in order to protect any marine archaeology uncovered during the lifetime of the project. Measures within the WSI include the ongoing monitoring of Archaeological Exclusion Zones (AEZs) and the archaeological receptors within to inform the effectiveness of the AEZs. The PAD will establish the procedure for the reporting and preservation of any archaeological material encountered in the course of the Morgan Generation Assets.</p> <p>Across the project lifetime, the effects on marine archaeology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Alteration of sediment transport regimes.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the project lifetime, the effects on marine archaeology 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.



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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		

**Receptor-led effects**

Potential exists for interactions between indirect impacts to marine archaeological receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise through the following:

- Combined effects of sediment disturbance/deposition and the alteration of sediment transport regimes during the operation and maintenance phase.

The combination of sediment disturbance and alteration of sediment transport regimes has the potential to further expose or bury marine archaeology receptors. The measures adopted as part of the Morgan Generation Assets will ensure procedures for the continued monitoring of known archaeological material of significance within the marine archaeology study area and the investigation, protection and recording of any as yet unknown marine archaeology through the Offshore WSI and PAD. It is therefore predicted that any inter-related effect will not be of any greater significance than those impacts already assessed in isolation (i.e. minor adverse).

### Other sea users

- 15.6.3.13 For other sea users, the following potential impacts have been considered within the inter-related assessment:
- Displacement of recreational activities
  - Reduction or restriction of other offshore energy activities
  - Interference with the performance of Radar Early Warning Systems (REWS) located on oil and gas platforms
  - Potential impact of rerouted traffic on REWS alarm rates.
- 15.6.3.14 Table 15.15 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets and also the inter-related effects (receptor-led effects) that are predicted to arise for other sea users receptors.
- 15.6.3.15 Other sea users receptors and aviation and radar receptors are linked receptors and the inter-related effects (i.e. restriction on access to infrastructure by both vessel and helicopter) are described in Table 15.5 below.

**MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS**

**Table 15.15: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – other sea users.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Displacement of recreational activities.	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets, the presence of infrastructure, safety zones and advisory clearance distances may lead to the displacement of recreational activities from the Morgan Array Area. The level of recreational activity within the local other sea users study area is considered to be low to moderate. Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be publicised regularly across the project phases, advising of the location and nature of works, ensuring that recreational activities can be planned accordingly. There are other locations available for sailing and fishing in the east Irish Sea such that alternatives are available if required across the project phases.</p> <p>Across the Morgan Generation Assets lifetime, the effects on other sea users 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Reduction or restriction of other offshore energy activities.	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases, the installation, presence/maintenance and removal of infrastructure may lead to the reduction or restriction of other offshore energy activities in the local other sea users study area. Such activities may include surveys, drilling or vessel access to infrastructure for maintenance or decommissioning. Continued communication with other offshore energy operators will ensure relevant parties are kept informed of planned activities in order to minimise both spatial and temporal interactions between conflicting activities and maximise coexistence.</p> <p>Across the Morgan Generation Assets lifetime, the effects on other sea users 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Interference with the performance of REWS located on oil and gas platforms.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the Morgan Generation Assets lifetime, the effects on other sea 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.
Potential impact of rerouted traffic on REWS alarm rates.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the Morgan Generation Assets lifetime, the effects on other sea 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment.

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		

**Receptor-led effects**

Potential exists for spatial and temporal interactions between direct impacts to offshore energy operators as other sea users receptors and aviation and radar receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise from the following:

- Reduction or restriction of other offshore energy activities
- Creation of a physical obstacle to aircraft operations – helicopter operations (Volume 2, Chapter 11: Aviation and radar of the Environmental Statement).

There is potential for both vessel and helicopter access to existing and future offshore hydrocarbon infrastructure to be restricted by the presence of the Morgan Array Area. Restriction of vessel access to existing offshore energy assets has been assessed as minor adverse significance. Restriction of access for helicopters operating in support of the offshore hydrocarbon industry has been assessed as minor adverse significance (see Volume 2, Chapter 11: Aviation and radar of the Environmental Statement). Continued communication with other offshore energy operators will ensure relevant parties are kept informed of planned activities in order to minimise both spatial and temporal interactions between conflicting activities and maximise coexistence. Therefore, the significance of these combined effects on offshore energy operators will not be of any greater significance than the effects when assessed in isolation.

### **Seascape, landscape and visual resources**

- 15.6.3.16 For seascape, landscape and visual resources, the following potential impacts have been considered within the inter-related assessment:
- Seascape impacts – potential change to seascape and marine character through the introduction of the Morgan Generation Assets infrastructure
  - Landscape impacts – potential change to landscape character through the introduction of the Morgan Generation Assets infrastructure
  - Visual receptor impacts – changes to the visual baseline scenario may cause effects on a variety of visual receptors.
- 15.6.3.17 Table 15.16 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets, and also the inter-related effects (receptor-led effects) that are predicted to arise for seascape, landscape and visual resources and receptors.
- 15.6.3.18 As previously noted in paragraph 15.5.2.7, seascape, landscape and visual resources receptors, socio-economics and human health are linked receptors and the inter-related effects (i.e. the impact on socio-economic and human health receptors) have been fully assessed in Volume 2, Chapter 13: Socio-economics and Volume 2, Chapter 14: Human health of the Environmental Statement.

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**Table 15.16: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – seascape, landscape and visual resources.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Seascape impacts – potential change to seascape and marine character through the introduction of the Morgan Generation Assets infrastructure.	✓	✓	✓	The potential effects of the presence of the Morgan Array Area within the seascape and marine character areas is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of potential effects is likely to be large within the Morgan Array Area itself and diminishing with increasing distance from the Morgan Array Area. The scale of potential effects will also increase through the construction phase and remain throughout the operations and maintenance phase, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on seascape and marine character resources 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment
Landscape impacts – potential change to landscape character through the introduction of the Morgan Generation Assets infrastructure.	✓	✓	✓	The potential effects of the presence of the Morgan Array Area on landscape character areas is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of effects will increase through the construction phase and remain throughout the operations and maintenance phase, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on landscape character resources 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Visual receptor impacts – changes to the visual baseline scenario may cause effects on a variety of visual receptors.	✓	✓	✓	The significance of effects experienced by visual receptors and on visual amenity, due to the introduction of the offshore infrastructure of the Morgan Generation Assets, are directly related to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The significance of effects will vary between significant and not significant for sea-based visual receptors, diminishing with distance from the offshore infrastructure, and not significant for land-based visual receptors, due to the distance from the offshore infrastructure. The scale of effects will increase through the construction phase and remain throughout the operations and maintenance phase, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on visual 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 or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment

### Receptor-led effects

There is the potential for spatial and temporal interactions between the potential impacts identified on seascape, landscape and visual resources receptors. The greatest potential for inter-related effects is through the interaction of impacts on the known visual receptors within the seascape, landscape and visual resources study area. Combined effects on visual receptors will vary temporally and spatially across the seascape, landscape and visual resources study area according to the activities that are being undertaken. The mobile nature of many of the visual receptors (e.g. ferry passengers, people working on fishing vessels, users of recreational vessels and commercial vessels) means that potential significant impacts will only occur when those receptors are in the vicinity of the Morgan Array Area. The significance therefore varies depending on the receptor's distance to the Morgan Array Area with those closest experiencing major impacts which then diminish with distance. The potential effects of construction will be temporary and will give way to operation and maintenance phase effects which will be fully reversible when the Morgan Generation Assets is decommissioned. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation (i.e. negligible to major adverse).

### Socio-economics

- 15.6.3.19 For socio-economics, the following potential impacts have been considered within the inter-related assessment:
- The potential impact on economic receptors including employment and GVA
  - The potential impact of increased employment opportunities
  - The potential impact on population, housing and accommodation
  - The potential impact on tourism
  - The potential impact on the Isle of Man associated with potential adverse effects on lifeline ferry services.
- 15.6.3.20 Table 15.17 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets, and also the inter-related effects (receptor-led effects) that are predicted to arise for socio-economics receptors.
- 15.6.3.21 As previously noted in paragraph 15.5.2.7, socio-economics, shipping and navigation, seascape, landscape and visual resources and human health receptors are linked and the inter-related effects associated with potential impacts on these receptors has been assessed in Volume 2, Chapter 13: Socio-economics of the Environmental Statement and Volume 2, Chapter 14: Human health of the Environmental Statement.



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**Table 15.17: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – socio-economics.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
<b>Economic</b>					
The potential impact on economic receptors including employment and Gross Value Added (GVA).	✓	✓	✓	<p>There is likely to be beneficial effects on employment and GVA throughout the construction, operations and maintenance and decommissioning phases.</p> <p>Employment and GVA effects will occur within different locations and sectors of the economy, and at different times and intensities. In combination the Morgan Generation Assets will provide a long-term employment and GVA stimulus.</p> <p>These effects 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.</p>	No change resulting from inter-related assessment
The potential impact of increased employment opportunities.	✓	✓	✓	<p>There will be beneficial effects on the potential for local workers to access employment throughout the construction, operations and maintenance and decommissioning phases.</p> <p>Access to employment effects will occur within different locations, sectors of the economy, and labour market, and at different times and intensities. In combination the Morgan Generation Assets will provide a long-term employment stimulus.</p> <p>These effects 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.</p>	No change resulting from inter-related assessment
<b>Social</b>					
The impact on population, housing and accommodation.	✓	✓	✓	<p>Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services. Direct and indirect employment generated during the operations and maintenance phase could also increase demand for housing, accommodation and local services. It is anticipated that due to the long term nature of the operations and maintenance requirements, the workforce will live locally. Some of those may relocate to the area requiring long term/permanent housing within the vicinity of the operations and maintenance port. Direct and indirect employment generated during the decommissioning phase could increase demand for housing, accommodation and local services. The housing and accommodation needs of employment during each phase differs.</p> <p>These effects 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.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		

**Tourism**

The potential impact on tourism.	✓	✓	✓	Potential impacts of the construction, operations and maintenance and decommissioning of the Morgan Generation Assets on tourism and recreation are indirect in nature. These effects 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.	No change resulting from inter-related assessment
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**Isle of Man**

The potential impact on the Isle of Man associated with potential adverse effects on lifeline ferry services.	✓	✓	✓	<p>There is likely to be minor adverse socio-economic impacts on the Isle of Man during the construction, operations and maintenance and decommissioning of the Morgan Generation Assets.</p> <p>The impacts to commercial operators including strategic routes, lifeline ferries and adverse weather routeing are not anticipated to be substantially different across the project lifetime. Therefore, subsequent impacts on the Isle of Man are anticipated to be similar across the project lifetime.</p> <p>These effects 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.</p>	No change resulting from inter-related assessment
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**Receptor-led effects**

Expenditure associated with the Morgan Generation Assets will result in employment and GVA impacts – these impacts are the basis for assessing potential socio-economic effects. Therefore the interactions between socio-economic receptors are inherent in the assessments of these impacts. It is not possible for the identified socio-economic impacts to act together in a manner that multiplies effects.

Employment-related receptors are likely to interact with the demand for housing, accommodation and local services receptor. In the event that employment and GVA impacts were to increase or decrease, effects related to the demand for housing, accommodation and local services would similarly increase or decrease. However, these impacts would not act together in a manner that multiplies effects.

Potential impacts on visual resources on the Isle of Man could combine with potential impacts on socio-economic conditions on the Isle of Man associated with potential adverse effects on lifeline ferry services. This could have synergistic adverse effects on the Isle of Man visitor and leisure economy. However, any synergistic adverse effects are not anticipated to lead to effects of greater significance than the assessments presented for each individual receptor. Therefore, these inter-related effects would not be significant in EIA terms.

## Human health

- 15.6.3.22 For human health, the following potential impacts have been considered within the inter-related assessment:
- Transport modes, access and connectivity
  - Community identify, culture, resilience and influence
  - Employment and income
  - Climate change and adaptation
  - Wider societal infrastructure and resources.
- 15.6.3.23 Table 15.18 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets, and also the inter-related effects (receptor-led effects) that are predicted to arise for human health receptors.
- 15.6.3.24 As previously noted in paragraph 15.5.2.7, human health, shipping and navigation, seascape, landscape and visual resources and socio-economic receptors are linked and the inter-related effects associated with potential impacts on these receptors has been assessed in Volume 2, Chapter 13: Socio-economics of the Environmental Statement and Volume 2, Chapter 14: Human health of the Environmental Statement.

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**Table 15.18: Summary of likely significant inter-related effects on the environment for project lifetime effects and receptor-led effects – human health.**

<sup>a</sup> C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Transport modes, access and connectivity.	✓	✓	✓	<p>The long term effects on population health for the Isle of Man due to the Morgan Generation Assets has been considered. This takes into account influences on medical deliveries, food supplies and healthcare journeys, as well as collision and allision risk. The significance conclusions of the main health and wellbeing assessment would not be greater for population health. Additive or synergistic effects between assessment years are not expected. It remains the case that in all project phases there would be continuity in health-related access, including that medical supplies are routinely scheduled on the Wednesday early morning sailing (02:15) from Heysham to Douglas, a timing when accumulated delays from earlier sailings are unlikely.</p> <p>Across the project lifetime, the effects on population health for the Isle of Man 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 or when considered in conjunction with other topics addressed in the Environmental Statement.</p>	No change resulting from inter-related assessment
Community identify, culture, resilience and influence.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p>	No change resulting from inter-related assessment
Employment and income.	✓	✓	✓	<p>Long term socio-economic effects across the project lifetime have been considered. This takes into account employment and economic effects associated with potential impacts on commercial fisheries.</p> <p>Across the project lifetime, the effects 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.</p>	No change resulting from inter-related assessment
Climate change and adaptation.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p>	No change resulting from inter-related assessment
Wider societal infrastructure and resources.	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p>	No change resulting from inter-related assessment

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Description of impact	Phase <sup>a</sup>			Likely significant inter-related effects	Inter-related significance
	C	O	D		

**Receptor-led effects**

A small minority of the population of the Isle of Man may experience views of the Morgan Generation Assets (adversely affecting community identity health outcomes) and adverse impacts affecting health due to shipping route disruption. Combined effects are considered likely during the operations and maintenance phase, once the Morgan Generation Assets are a feature of the seascape. The combined effects may particularly affect vulnerable groups with existing poor health and low incomes. At a population level it is not expected that the effects would interact in such a way that would significantly change population health outcomes. No greater effect is therefore likely.

Nationally the population would benefit both from a reduction in the severity of health effects associated with climate change and from the benefits to public health of energy security. Effects would be greatest for vulnerable groups, particularly those on low incomes less able to adapt or afford alternatives. As the effects associated with climate change are expected to be driven by the benefit to deprived populations globally, the combined effect in the UK of these health determinants is not expected to be greater than the individual effects.

## **15.7 Summary**

- 15.7.1.1 The tables presented within this chapter assess potential inter-related effects arising from the Morgan Generation Assets on a range of receptor groups. Much of the content of these tables has been based upon assessments of individual impacts presented in the topic-specific Environmental Statement chapters. The identification of potential inter-related effects has been based on a largely qualitative assessment using expert judgement and has noted that inter-related effects have already been accounted for, in many instances, within the assessments in the topic-specific chapters. The following conclusions arise in the context of physical, biological and human environments.

## **15.8 Conclusion**

- 15.8.1.1 This chapter has defined the potential inter-related effects considered to arise from the Morgan Generation Assets. Project lifetime and receptor-led effects have been defined in order to differentiate the two types of inter-related effects that may arise as a result of the Morgan Generation Assets.
- 15.8.1.2 Based on one or a combination of the following factors: the low sensitivity of receptors; temporary and small scale nature of effects; availability of alternative habitats; and also factoring in proposed mitigation measures, the overall significance of any inter-related effects was not judged to increase above the significance value assessed for individual effects in the topic-specific chapters.

## 15.9 References

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