



Morven Hawthorn Pit Grid Connection Project

Preliminary Environmental Information Report

Volume 4, Chapter 5: Inter-related Effects

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Glossary

Term	Meaning
Commitments	Measures (embedded mitigation and secondary) to be adopted during the construction, operation and maintenance and decommissioning phases of the MHPGC Project.
Cumulative effect	The combined effect of the MHPGC Project in combined with the effects from other proposed developments, on the same receptor or resource.
Development Consent Order (DCO)	An order made under the Planning Act 2008, as amended, granting development consent.
Dust	Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter are often used interchangeably, although in some contexts one term tends to be used in preference to the other. In this guidance, the term 'dust' has been used to include the particles that give rise to soiling, and to human health and ecological effects (IAQM, 2024).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Electromagnetic Field (EMF)	An electric and magnetic force field that surrounds a moving electrical charge.
Embedded mitigation	Measures included as part of the project design. Includes both primary and tertiary mitigation.
Environmental Impact Assessment (EIA)	Assessment of the potential likely significant effects of the MHPGC Project on the physical, biological, and human environment during construction, operations and maintenance (O&M) and decommissioning, in support of the DCO application.
Groundwater	All water which is below the surface of the ground in the saturated zone and in direct contact with the ground or subsoil.
Health	State of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-related effects	Effects that may arise from the interactions between different EIA topic effects considered within the project-alone assessment, potentially leading to more significant effects than if they were to be considered in isolation
Invasive non-native species (INNS)	Species introduced outside their natural range that spread rapidly and cause harm to the environment, economy or human health. They often outcompete native species and disrupt ecosystems.
Landfall	The area in which the offshore export cables make landfall (come onshore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area between the trenchless technique exit pits and the transition joint bay inclusive of all construction works.

Term	Meaning
Marine Directorate Licensing Operations Team (MD-LOT)	The part of the Scottish Government's Marine Directorate responsible for assessing and administering applications for marine licences and Section 36 consent (offshore) in Scotland.
Marine Management Organisation (MMO)	The MMO, as a UK government body, is responsible for licensing, regulating and overseeing activities in the marine environment for English waters. For a DCO and deemed marine licence, the MMO acts as a statutory consultee, advising on marine planning, environmental impacts, habitats and compliance with marine licensing regulations.
Mean High Water Springs (MHWS)	The most inshore level location reached by the sea at high tide during mean high water spring tide. This is defined as the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The average height of the low water levels of each pair of successive low waters during the periods of about 24 hours when the tidal range is at its greatest.
MHPGC Project Environmental Statement (ES)	The document presenting the results of the Environmental Impact Assessment process.
MHPGC Project Preliminary Environmental Information Report (PEIR)	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
MHPGC Project PEIR Red Line Boundary	The area within which all components of the MHPGC Project will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds).
MHPGC Project Scoping Opinions	Separate scoping opinions received from PINS (on behalf of the Secretary of State) and MD-LOT (on behalf of the Scottish Ministers) in response to the MHPGC Project Scoping Report. The MHPGC Project Scoping Opinions contain the range of issues that PINS, and MD-LOT in consultation with statutory stakeholders, have identified should be considered within the EIA process.
MHPGC Project Scoping Report	A Scoping Report for the MHPGC Project, scoping the likely significant effects of the project on the environment, was submitted and accepted by Planning Inspectorate (PINS) and submitted to the Scottish Ministers, via the Marine Directorate – Licencing Operations Team (MD-LOT) in February 2025.
Morven Hawthorn Pit Grid Connection Project	The MHPGC Project is comprised of the offshore export cables in Scottish and English waters from the Morven North or the Morven South offshore substation platform(s) (OSP), landfall, onshore export cables, the onshore land substation (LSS) and AC connection cables. Also referred to in this report as the MHPGC Project, for ease of reading.
National Grid Hawthorn Pit Substation	The National Grid substation at Hawthorn Pit, County Durham, which the AC connection cables will connect into from the onshore land substation.

Term	Meaning
Noise	The terms noise and sound are often used interchangeably. Noise usually refers to unwanted or disturbing sounds that interfere with normal hearing and can be unpleasant or harmful. It is often characterised by irregularities in the sound waves and is considered a form of sound pollution.
Operations and maintenance phase (O&M)	The operational and maintenance phase of the MHPGC Project.
Planning Inspectorate (PINS)	The PINS is an executive agency of the UK Government responsible for administering and examining DCO applications for NSIPs in England. PINS manages the application process, oversees consultation and examination, and makes a recommendation to the relevant Secretary of State on whether consent should be granted.
Primary mitigation	Measures included as part of the location or design of the MHPGC Project made during the pre-application phase that are an inherent part of the MHPGC Project and do not require additional action to be taken. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the MHPGC Project, the parameters and associated commitments secured by the DCO and marine licence, or both.
Residual effects	Consequences, impacts, or attributes that continue to exist after designed in mitigation has been applied.
Secondary mitigation	Actions that will require further activity to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES. These include measures required to reduce the significance of environmental effects and may be secured through an environmental management plan. For secondary mitigation measures both pre-mitigation and residual effects are presented.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Surface water	Inland water bodies present on the Earth's surface, including rivers, streams, lakes and transitional waters, and, for regulatory purposes, extending to certain coastal waters.
Tertiary mitigation	Actions that would occur with or without input from the EIA process feeding into the design. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
The Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific Study Area. Specific Study Areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of MHPGC Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Unexploded Ordnance (UXO)	Unexploded ordnance are explosive weapons (e.g. bombs, shells, grenades, land mines and naval mines etc.) that did not explode

Term	Meaning
	when they were employed and still pose a risk of detonation, potentially many decades after they were used or discarded.

Acronyms

Unit	Meaning
AC	Alternating Current
AIL	Abnormal Indivisible Load
BMV	Best and Most Versatile
CBRA	Cable Burial Risk Assessment
DCO	Development Consent Order
DESNZ	Department for Energy Security & Net Zero
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
ES	Environmental Statement
GES	Good Environmental Status
ICCI	In-Combination Climate Change Impact
INNS	Invasive Non-Native Species
LSS	Land Substation
MD-LOT	Marine Directorate – Licensing Operations Team
MDS	Maximum Design Scenario
MHPGC	Morven Hawthorn Pit Grid Connection
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Plan
MMO	Marine Management Organisation
NPPF	National Planning Policy Framework
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
O&M	Operations and Maintenance
OEMP	Offshore Environmental Management Plan
OSP	Offshore Substation Platform
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PRoW	Public Rights of Way
SoS	Secretary of State
SRA	Strategic Road Network

SSC	Suspended Sediment Concentration
UXO	Unexploded Ordnance
VTMP	Vessel Traffic Management Plan
WFD	Water Framework Directive

5 Inter-related effects

5.1 Introduction

- 5.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary findings of the Environmental Impact Assessment (EIA) work undertaken to date for the Morven Hawthorn Pit Grid Connection Project (hereafter 'MHPGC Project'), as described in **Volume 1, Chapter 2: Project Description, of the PEIR**.
- 5.1.1.2 The chapter considers the potential offshore and onshore inter-related effects that could result from the construction, operation and maintenance (O&M) and decommissioning phases of the MHPGC Project. Specifically, it relates to the offshore elements of the MHPGC Project from the offshore substation platform(s) (OSPs) within Morven North Offshore Wind Array Project or Morven South Offshore Wind Array Project (hereafter 'Morven North and Morven South') located within Scottish offshore waters, transiting through English offshore and inshore waters, to Mean High Water Springs (MHWS) at landfall and the onshore elements of the MHPGC Project landward of Mean Low Water Springs (MLWS) at landfall to the National Grid Hawthorn Pit Substation in England.
- 5.1.1.3 Inter-related effects refer to the interactions between technical topic assessments and are considered for 'project lifetime effects' and 'receptor-led effects'. Further detail is provided in **Section 5.4.3**.
- 5.1.1.4 The assessment presented in this chapter has taken into account relevant impact assessments provided in the PEIR as set out in **Table 5.1**.

Table 5.1: Topic chapters of the PEIR used to inform the inter-related effects

PEIR
Volume 2 – Effects on the offshore environment
Chapter 1: Physical Processes
Chapter 2: Offshore Water and Sediment Quality
Chapter 3: Benthic Subtidal and Intertidal Ecology
Chapter 4: Fish and Shellfish Ecology
Chapter 5: Marine Mammals
Chapter 6: Marine Ornithology
Chapter 7: Commercial Fisheries
Chapter 8: Shipping and Navigation
Chapter 9: Marine and Intertidal Archaeology Chapter
Chapter 10: Infrastructure and Other Sea Users
Volume 3 – Effects on the onshore environment
Chapter 1: Geology, Hydrogeology and Ground Conditions
Chapter 2: Water Resources and Flood Risk
Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology
Chapter 4: Onshore Archaeology and Cultural Heritage
Chapter 5: Traffic and Transport
Chapter 6: Onshore Noise and Vibration
Chapter 7: Onshore Air Quality
Chapter 8: Land Use Tourism and Recreation

Chapter 9: Agriculture and Soil
Volume 4 – Effects on the onshore and offshore environment
Chapter 1: Landscape and Visual Amenity
Chapter 2: Human Health
Chapter 3: Socio-Economics
Chapter 4: Climate Change

5.2 Legislative and policy context

5.2.1 Overview

5.2.1.1 The full relevant legislation and policy context for the MHPGC Project has been detailed in **Volume 1, Chapter 5: Policy and Legislation, of the PEIR**. This section sets out the legislation and planning policy that is relevant to the preliminary inter-related effects assessment.

5.2.2 National policy context

National Policy Statements

- 5.2.2.1 The MHPGC Project is being progressed through the Development Consent Order (DCO) regime following a direction made by the Secretary of State (SoS) under Section 35 of the Planning Act 2008. Although the Project is not a Nationally Significant Infrastructure Project (NSIP), National Policy Statements (NPSs) provide the primary policy framework against which the application will be considered. NPSs set out the policies, requirements and assessment criteria that the MHPGC Project must address in order to obtain development consent and proceed.
- 5.2.2.2 There are currently six energy NPSs, three of which contain policy relevant to offshore wind development and the MHPGC Project, specifically:
- NPS for energy (EN-1) (Department for Energy Security & Net Zero (DESNZ), 2025a);
 - NPS for renewable energy infrastructure (EN-3) (DESNZ, 2025b);
 - NPS for electricity networks infrastructure (EN-5) (DESNZ, 2025c).. Of the three NPSs identified, one of these, NPS EN-1 addresses the consideration of interrelationships between effects.
- 5.2.2.3 **Table 5.2** provides details of the NPS relevant to inter-related effects and how and where they are covered in the PEIR. Of the three NPSs identified, one of these, NPS EN-1 addresses the consideration of interrelationships between effects.

Table 5.2: Summary of the NPS provisions relevant to inter-related effects

Summary of relevant NPS provisions	How and where considered in the PEIR
NPS EN-1	
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)	Project lifetime effects and receptor-led effects are assessed throughout this chapter of the PEIR. Section 5.5 provides the assessment of inter-related effects.

5.3 Consultation and engagement

5.3.1 Scoping

- 5.3.1.1 A Scoping Report for the MHPGC Project was issued to the Planning Inspectorate (PINS) and Marine Directorate – Licensing Operations Team (MD-LOT) in February 2025 (RPS, 2025). Following consultation with the appropriate statutory bodies, PINS (on behalf of the SoS) and MD-LOT both provided Scoping Opinions in March 2025 (PINS, 2025; MD-LOT, 2025, respectively).
- 5.3.1.2 **Table 5.3** sets out the key comments raised during the scoping process specific to inter-related effects, with details of how these comments have been addressed within the PEIR.

Table 5.3: Summary of scoping responses relevant to inter-related effects

Comment	How and where considered in the PEIR
PINS	
<i>The ES should also describe any interactive or cumulative effects between the different project elements where these would lead to significant effects. (ID 221)</i>	Section 5.5 of this chapter provides the assessment of inter-related effects.
MMO	
<i>Similarly, inter-related impacts of the proposed development will also be considered, using the approach laid down in Chapter 4. The MMO considers that the Applicant has provided an adequate description of the potential cumulative and inter-related impacts and effects on the physical and biological environment with regards to benthic ecology (Section 3.5.4)</i>	The Applicant acknowledges the MMOs comment. Section 5.5 presents the assessment of inter-related effects.
<i>Inter-related effects will be considered across the project's lifetime and for individual stages of the development for receptors. (Section 3.7.9)</i>	The Applicant acknowledges the MMOs comment and confirms that the approach taken for inter-related effects has considered project lifetime effects, i.e., during construction, O&M and decommissioning phases. Section 5.5 presents the assessment of inter-related effects.

5.4 Methodology

5.4.1 Overview

- 5.4.1.1 **Volume 1, Chapter 2: Project Description, of the PEIR** sets out the description of the MHPGC Project and **Volume 1, Chapter 4: Approach to Environmental Impact Assessment, of the PEIR** sets out the overarching approach that has been used in developing the preliminary environmental information.
- 5.4.1.2 This section describes the methodology used to identify and assess potential inter-related effects, drawing on the relevant PEIR topic chapters and their respective baseline information and impact assessments.

5.4.2 Study area and data sources

- 5.4.2.1 Due to the differing spatial extent of effects experienced by different receptors, the study area and baseline environments for potential inter-related effects varies according to individual topics and receptor(s). The potential inter-related effects considered in this chapter are, therefore, also limited to the study areas defined in each of the topic chapters.

5.4.3 Impact assessment methodology

5.4.3.1 The approach to assessing inter-related effects has followed a four-stage process, as summarised in **Table 5.4** below and discussed in following paragraphs.

Table 5.4: Summary of staged approach to the inter-related effects assessment

Stage	Description
1	Assessments undertaken for individual EIA topic areas within Volume 2, 3 and 4.
2	Review of the likely receptors affected by more than one impact through analysis of the assessment of effect sections undertaken for individual EIA topic areas.
3	Identification of potential combination effects on these receptor groups through analysis of the assessment of effect sections undertaken for individual EIA topic areas.
4	Assessment undertaken on how individual effects may combine to create inter-related effects on each receptor group for: • 'Project lifetime effects', i.e., during construction, O&M and decommissioning phases; • 'Receptor-led effects', i.e., multiple simultaneous effects on a single receptor.

Stage 1: Topic-specific assessments

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

Stage 2: Identification of receptor groups

5.4.3.3 Stage 2 involved a review of the assessments undertaken in the topic chapters to identify 'receptor groups' requiring assessment within the inter-related effects. The term 'receptor group' is used to highlight that the fact that the proposed to inter-related effects assessment will not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors. The potential receptor groups have been identified from the topic assessments (see **Table 5.1**) and these have been considered in further detail at Stage 3 and 4.

5.4.3.4 Sensitive groups of receptors identified through the topic assessments and taken forward for the inter-related effects assessment are summarised below.

- Offshore Receptors
 - Physical processes receptors (including seabed morphology, coastal morphology and sediment transport processes)Offshore water quality receptors (including undesignated waters, WFD waterbodies, bathing waters and GES receptors);
 - Benthic ecology receptors (including benthic habitats, benthic communities and designated benthic features);
 - Fish and shellfish ecology receptors;
 - Marine mammal receptors;
 - Marine ornithology receptors;
 - Commercial fisheries receptors (including fishing fleets and commercially exploited species);
 - Marine navigation and shipping receptors (including commercial vessels, recreational vessels and ports);
 - Marine and intertidal archaeological receptors;
 - Other sea users and marine infrastructure receptors (including recreational users, disposal sites, subsea cables and pipelines, and military use areas).
- Onshore Receptors
 - Residential receptors (including residents and residential properties);

- Non-residential receptors (including workers, visitors, users of businesses, tourism, recreation and community facilities);
- Ecological receptors;
- Heritage assets;
- Transport receptors (including users of road and Public Right of Ways (PRoW));
- Water environment receptors (including surface water and groundwater);
- Geology and soil receptors;
- Landscape and visual receptors.

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

- 5.4.3.5 Following the identification of receptor groups the potential inter-related effects on the receptor groups were identified. This was informed by the topic assessments together with expert judgement.

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

- 5.4.3.6 A qualitative assessment has been undertaken to identify project lifetime effects and receptor led effects as defined in **Table 5.5** below.

Table 5.5: Definitions of project lifetime and receptor-led inter-related effects

Effect type	Description
Project lifetime effects	Effects that occur throughout multiple phases of the project (construction, O&M, and decommissioning) potentially interacting to create a more significant effect upon a receptor than if assessed for a single phase of the project.
Receptor-led effects	Effects that interact temporally and/or spatially resulting in inter-related effects upon a single receptor. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

- 5.4.3.7 The assessment has considered the potential for individual effects to interact to create a different or greater effect. Where potential project lifetime or receptor-led effects have already been considered within the relevant topic chapters of the PEIR, they have not been reassessed in this chapter. However, the conclusions of those assessments have been taken into account when determining whether any additional or greater inter-related effect could arise.
- 5.4.3.8 A separate significance category has not been assigned to each inter-related effect. Instead, a qualitative assessment has been undertaken using the findings of the relevant topic assessments and professional judgement. The assessment considers the sensitivity of the receptor, the nature and magnitude of the individual effects, whether the effects share a common receptor or impact pathway, their spatial and temporal overlap, their duration and reversibility, and the effectiveness of embedded and additional mitigation. On this basis, the assessment identifies whether effects acting together could result in an outcome of greater significance than the individual effects considered in isolation.
- 5.4.3.9 Climate Change has been scoped out of the inter-related effects assessment. Greenhouse gas (GHG) emissions are assessed at the scale of the global atmosphere, and their effects are inherently cumulative in nature. As such, there is limited potential for GHG emissions from the MHPGC Project to interact with other environmental effects in a manner that would alter the significance of effects identified within topic-specific assessments. Climate change effects arising from GHG emissions are therefore considered through the standalone GHG assessment and presented in **Volume 4, Chapter 4: Climate Change of the PEIR**. An In-Combination Climate Impact (ICCI) assessment considers where projected changes in climate may exacerbate existing risks identified within other environmental topic areas. An ICCI will be undertaken for the project at ES stage and presented in the relevant topic Chapters.

5.5 Assessment of inter-related effects

5.5.1.1 The assessment of inter-related effects is presented within tables in this section as follows.

- **Table 5.6:** Physical processes;
- **Table 5.7:** Offshore Water and Sediment Quality;
- **Table 5.8:** Benthic subtidal and intertidal ecology;
- **Table 5.9:** Fish and shellfish ecology;
- **Table 5.10:** Marine mammals;
- **Table 5.11:** Marine ornithology;
- **Table 5.12:** Commercial fisheries;
- **Table 5.13:** Shipping and navigation;
- **Table 5.14:** Marine and Intertidal Archaeology;
- **Table 5.15:** Infrastructure and Other Sea Users;
- **Table 5.16:** Geology, hydrogeology and ground conditions;
- **Table 5.17:** Water Resources and Flood Risk;
- Table 5.18: Terrestrial Ecology and Terrestrial and Intertidal Ornithology;
- Table 5.19: Onshore Archaeology and Cultural Heritage;
- Table 5.20: Traffic and Transport;
- Table 5.21: Onshore Noise and Vibration;
- Table 5.22: Onshore Air Quality;
- Table 5.23: Land Use Tourism and Recreation;
- Table 5.24: Agriculture and Soils;
- Table 5.25: Landscape and Visual Amenity;
- Table 5.26: Human Health;
- Table 5.27: Socio-Economics;

5.5.2 Assessment of Offshore inter-related effects

Table 5.6: Physical processes - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Changes to suspended sediment concentration (SSC)	✓	✓	✓	Increased SSC caused by seabed disturbance will primarily occur during the construction and decommissioning phases of the MHPGC Project. Elevated levels of SSC may also occur during the O&M phase although the overall amount of seabed disturbance will be comparatively less during this phase. An assessment of the potential SSC increases is presented within Volume 2, Chapter 1: Physical Processes, of the PEIR and reported no measurable changes from baseline SSC after 24 hours to 48 hours following cessation of activities. Given the short-term nature of the works and presence of the sediment plumes, any increase in SSC within the water column would be immeasurable in practice following dispersion of the sediment plume and any increase in SSC will not persist across multiple phases. The spatial extent of meaningful seabed disturbance and associated increases in SSC and deposition is expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater change than for those assessed individually. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	This change relates to a pathway, rather than an impact on a receptor. Accordingly, no statement is made with regards to the likelihood of significant inter-related effects.
Changes to sediment transport pathways due to the presence of infrastructure	✓	✓	✓	Changes to the sediment regime will be greatest when all MHPGC Project infrastructure is in place. Although some change may occur during the construction and decommissioning phase (when the MHPGC Project is partially built/decommissioned), the cumulative changes over the MHPGC Project lifetime are not expected to be measurably greater than those assessed separately. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	This change relates to a pathway, rather than an impact on a receptor. Accordingly, no statement is made with regards to the likelihood of significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Impacts to seabed morphology due to the presence of infrastructure	✓	✓	✓	In theory, the morphology of designated areas of seabed could be subject to project-lifetime inter-related effects, with direct seabed disturbance occurring in the construction and decommissioning phase and indirect disturbance occurring during the O&M phase due to hydrodynamic, wave and sediment transport blockage related effects. However, in all cases the extent of change is expected to be negligible and even if combined over the MHPGC Project lifetime, the magnitude of change (and therefore overall significance of effect) would be no greater than if assessed in isolation. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Impacts to coastal morphology due to the presence of infrastructure	✓	✓	✓	In theory, the morphology of designated areas of the coast could be subject to project-lifetime inter-related effects, with direct seabed disturbance occurring in the construction and decommissioning phase and indirect disturbance occurring during the O&M phase due to hydrodynamic, wave and sediment transport blockage related effects. However, in all cases the extent of change is expected to be negligible and even if combined over the MHPGC Project lifetime, the magnitude of change (and therefore overall significance of effect) would be no greater than if assessed in isolation. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					
No receptor-led impacts have been identified. This is because the different physical processes studied are already inter-related; for instance, morphological change is closely linked to change in sediment transport and therefore these linked processes have already been considered within the assessment. In turn, this information on changes to physical processes has been used to inform other PEIR topics. Assessments have been undertaken separately within these individual topic chapters and are not reported here as additional inter-relationships.					

Table 5.7: Offshore Water and Sediment Quality- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Changes to SSC and associated deposition	✓	✓	✓	The activities resulting in the highest sediment disturbance will occur during the construction phase, with any effects caused deemed to be temporary. An assessment of the potential SSC increases is presented within Volume 2, Chapter 1: Physical Processes, of the PEIR and reported no measurable changes from baseline SSC after 24 hours to 48 hours following cessation of activities. Given the short-term nature of the works and presence of the sediment plumes, within the Offshore Water and Sediment Quality Study Area any increase in SSC within the water column would be immeasurable in practice following dispersion of the sediment plume. The interaction of these impacts between the construction, operation and decommissioning of the MHPGC Project is not predicted to result in any greater significance than those assessed in the individual project phases due to the short timeframes associated with the presence of sediment plumes and comparatively longer time frames associated with MHPGC Project phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Impacts from the release of sediment-bound contaminants	✓	✓	✓	The release of sediment-bound contaminants may occur during construction, O&M and decommissioning activities that disturb the seabed. Contaminant concentrations are generally low within Scottish waters and across most of the MHPGC Project area, with some higher levels present within parts of the southern offshore export cable corridor. Any contaminants released would be temporary, localised and would quickly disperse and settle once activities cease. The interaction of these impacts across the construction, O&M and decommissioning phases is therefore not predicted to result in effects of greater significance than those assessed for the individual project phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Impacts to bathing water quality	✓	✓	✓	Changes to SSC and mobilisation of previously sediment bound contaminants from seabed preparation and cable installation (including trenchless techniques) could potentially impact the bathing water quality. Seabed disturbance and subsequent resuspension of sediment-bound contaminants within the vicinity of Bathing Waters will primarily occur during the construction and decommissioning phases of the MHPGC Project with deposition expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). During O&M seabed disturbance may occur however these will likely be spatially and temporally isolated events. Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater change than for those assessed individually. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Impacts to the achievement of Good Environmental Status (GES) .	✓	✓	✓	Changes to SSC and mobilisation of previously sediment bound contaminants from seabed preparation and cable installation (including trenchless techniques) could potentially impact the potential to achieve GES. Seabed disturbance and subsequent resuspension of sediment-bound contaminants within the vicinity of Water Framework Directive (WFD) Coastal Waterbodies will primarily occur during the construction and decommissioning phases of the MHPGC Project with deposition expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). During O&M seabed disturbance may occur however these will likely be spatially and temporally isolated events. Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater change than for those assessed individually. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Impacts to sediment transport and sediment transport pathways due to the presence of infrastructure	X	✓	X	Changes to the sediment regime are considered during the O&M phase only, as they are associated with the long-term presence of infrastructure on the seabed following construction and throughout the lifetime of the MHPGC Project. Any impacts will be greatest when all MHPGC Project infrastructure is in place. Although some change may occur during the construction and decommissioning phase (when the MHPGC Project is partially built/decommissioned), the cumulative changes over the MHPGC Project lifetime are not expected to be measurably greater than those assessed separately. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					
Sediment disturbance caused by the MHPGC Project has the potential to reduce water quality. Higher SSC decreases the depth to which UV light can penetrate the water column and may result in a reduction of primary production, dissolved oxygen and bacterial mortality. This has the potential to cause secondary effects of minor significance on benthic ecology and fish and shellfish ecology during construction, O&M and decommissioning. The release of sediment-bound contaminants from activities disturbing the sediment could lead to an increased contaminant bioavailability with the potential for ecotoxicological effects. However, due to the low levels of contaminants recorded during the Gardline (2025) surveys within the Scottish, northern and central areas of the MHPGC Project, and the temporary nature (<48 hours) of sediment plumes that may carry the elevated contamination recorded within the southern areas of the MHPGC Project, it is considered unlikely that there would be any pathways for secondary effects on benthic ecology or fish and shellfish ecology receptors. Therefore, the significance of these secondary effects is considered to be minor. Therefore, the significance of the secondary effects on benthic ecology and fish and shellfish ecology is considered to be minor.					

Table 5.8: Benthic subtidal and intertidal ecology - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Long term habitat loss	X	✓	X	Long term habitat loss effects occur during the O&M phase, once infrastructure has been placed on the seabed during construction and will remain in place for the lifetime of the MHPGC Project. Construction activities are only considered to result in temporary	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				habitat loss effects through sandwave levelling and cable trenching for example. Therefore, long term habitat loss is considered during the O&M phase only. Decommissioning may involve removal of infrastructure and the loss of any communities established on hard substrates during operation, however this is considered under its own impact. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Temporary habitat loss/disturbance	✓	✓	✓	There may be a limited potential for inter-related effects on benthic ecology features during all phases of the MHPGC Project. However, inter-related effects on benthic ecology features are expected to be no more significant than individual impacts assessed in isolation in due to effects being localised, temporary and reversible, with recovery of affected habitats expected between disturbance events. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Increased SSCs and associated deposition	✓	✗	✓	Increased SSC caused by seabed disturbance will primarily occur during the construction and decommissioning phases of the MHPGC Project. The spatial extent of meaningful seabed disturbance and associated increases in SSC and deposition is expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater change than for those assessed individually. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Disturbance/remobilisation of sediment bound contaminants	✓	✗	✓	Disturbance/remobilisation of sediment bound contaminants caused by seabed disturbance will primarily occur during the construction and decommissioning phases of the MHPGC Project. The spatial extent of meaningful seabed disturbance and associated disturbance/remobilisation of sediment bound contaminants is expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater change than for those assessed individually.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Changes in physical processes	X	✓	X	Changes in physical processes are considered during the O&M phase only, as they are associated with the long-term presence of infrastructure on the seabed following construction and throughout the lifetime of the MHPGC Project. Construction activities would only result in temporary and localised disturbances to physical processes and are not expected to cause significant or sustained changes. Similarly, decommissioning activities would involve the removal of infrastructure and any associated changes to physical processes would be temporary and short term in nature. Therefore, project lifetime effects for this impact have not been considered further.	No project lifetime inter-related effects identified.
Increased risk of introduction and spread of Invasive Non-Native Species (INNS)	✓	✓	✓	An increased risk of introduction and spread of INNS has been identified during construction, O&M and decommissioning through vessel movements, biofouling, ballast water discharge and the presence of hard infrastructure. While these pathways occur throughout the project lifecycle, implementation of the Outline Marine Biosecurity Plan (CoT38), adherence to ballast water management requirements and biosecurity controls will minimise the likelihood of introduction and establishment of INNS. Given the negligible magnitude of effect identified for each project phase, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Colonisation of hard structures	X	✓	X	Colonisation of hard structures is considered during the O&M phase only, as it results from the long-term presence of artificial hard substrate on the seabed. While some initial colonisation may occur during construction, the development of substantial benthic communities is more likely to occur during the O&M phase. Decommissioning may remove any communities established during operation; however, this is considered a separate effect. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Removal of hard substrates	X	X	✓	Removal of hard substrate is only anticipated during the decommissioning phase. Any effects are expected to be highly localised and relate to the loss of benthic communities that have colonised project infrastructure during operation. The effect has been assessed as a standalone decommissioning impact and no further assessment of project lifetime inter-related effects is required.	No project lifetime inter-related effects identified.
Impacts to benthic invertebrates due to Electromagnetic Fields (EMF)	X	✓	X	EMF effects are only anticipated during the O&M phase. Available evidence indicates that EMF effects are highly localised, behavioural responses are limited, and there is no clear evidence of biologically significant effects at population or community levels. The effect has been assessed as a standalone O&M impact. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Impacts to benthic invertebrates due to thermal emissions from subsea electrical cables	X	✓	X	Thermal effects are only anticipated during the O&M phase. Available evidence indicates that thermal effects are highly localised, with temperature increases expected to be minimal and below levels associated with significant ecological effects. The effect has been assessed as a standalone O&M impact and no further assessment of project lifetime inter-related effects is required., therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					
Benthic habitats and species may be exposed to multiple project-related effects. These effects have the potential to overlap spatially and temporally for some receptors. However, the majority of effects are predicted to be localised, temporary and reversible, while operational effects associated with hard substrate, EMF and thermal emissions are highly restricted to the immediate vicinity of the offshore export cable corridor. Taking account of the findings of the individual assessments and embedded mitigation measures, no materially greater effect on benthic receptors is anticipated as a result of these interactions and no significant receptor-led inter-related effects have been identified.					

Table 5.9: Fish and shellfish ecology - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Long term habitat loss	X	✓	X	Long term habitat loss effects occur during the O&M phase once infrastructure has been placed on the seabed during construction and will remain in place for the operational lifetime of the MHPGC Project. Construction activities are only considered to result in temporary habitat loss effects (e.g. through sandwave levelling and cable trenching) restricted to the construction phase, while decommissioning effects are assessed separately under the relevant impact pathways, which may involve the removal of infrastructure and loss of any communities established on hard substrates during operation. As long-term habitat loss is confined to the O&M phase and does not interact with equivalent effects during construction or decommissioning, there is no potential for project lifetime inter-related effects. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Temporary habitat loss and disturbance	✓	✓	✓	There may be a limited potential for project lifetime inter-related effects associated with temporary habitat loss and disturbance to fish and shellfish ecology receptors across the construction, O&M and decommissioning phases. However, these are expected to be localised, temporary and reversible, with recovery of affected habitats anticipated between disturbance events. In addition, temporary habitat loss and disturbance during the O&M phase would be substantially lower than during construction and decommissioning and would be limited to infrequent maintenance activities where required. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Increased SSCs and associated deposition	✓	✓	✓	Increased SSC and associated sediment deposition caused by seabed disturbance may occur during the construction, O&M and decommissioning phases of the MHPGC Project. The spatial extent of meaningful increases in SSC and associated sediment deposition is expected to be localised, mainly within the near-field and intermediate	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				impact zones of the activity (up to 500m). Increases in SSC are expected to be temporary, with affected fish and shellfish ecology receptors returning to baseline conditions shortly after disturbance ceases. As such, effects from increased SSC and deposition are not anticipated to persist into subsequent phases of the development or accumulate over the project lifetime. The interaction of these impacts across the construction, O&M and decommissioning phases is therefore not predicted to result in effects of greater significance than those assessed for the individual project phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Disturbance/remobilisation of sediment bound contaminants	✓	✓	✓	Disturbance and remobilisation of sediment-bound contaminants caused by seabed disturbance may occur during the construction, O&M and decommissioning phases of the MHPGC Project. The spatial extent of any meaningful remobilisation is expected to be localised and restricted to the area of disturbance, with contaminants rapidly dispersed and diluted by local hydrodynamic processes. Sediment chemistry data indicate generally low concentrations of contaminants across the MHPGC Project PEIR Red Line Boundary, with levels largely consistent with natural background variation. Cumulative changes over the lifetime of the MHPGC Project are therefore not expected to result in measurably greater effects than those assessed individually. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Underwater sound (excluding unexploded ordnance (UXO))	✓	✓	✓	There may be a limited potential for inter-related effects on fish and shellfish ecology receptors arising from underwater sound during the construction, O&M and decommissioning phases of the MHPGC Project. However, inter-related effects are not expected to be greater than the individual effects assessed in isolation, as underwater sound effects are predicted to be localised, intermittent and temporary. Mortality and injury effects are generally restricted to areas close to the source, whilst behavioural disturbance and auditory masking effects are reversible and limited to the duration of the activity. Recovery is expected following cessation of activities, with no evidence that effects would persist between disturbance events or	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				project phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Underwater sound from UXO clearance	✓	✗	✗	Underwater sound from UXO clearance may occur during the construction phase of the MHPGC Project only. While up to 22 low order UXO clearance events have been assessed, each clearance event would be discrete, temporary and highly localised in nature. The project-alone assessment concluded that, for low-order clearance, the spatial extent of potential mortality, injury, behavioural disturbance and auditory masking effects would be limited, with effects reducing rapidly with distance from the source and resulting in effects of no greater than minor adverse significance. Although UXO clearance activities may coincide with spawning periods of some fish and shellfish receptors, individual clearance events are not expected to result in prolonged displacement from spawning grounds or long-term effects on populations. As UXO clearance is restricted to the construction phase and does not continue into the O&M or decommissioning phases, and given the localised and temporary nature of effects associated with low-order clearance, there is no pathway through which effects could accumulate over the lifetime of the MHPGC Project. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Increased introduction and spread of INNS	✓	✓	✓	An increased risk of introduction and spread of INNS has been identified during construction, O&M and decommissioning through vessel movements, biofouling, ballast water discharge and the presence of hard infrastructure. While these pathways occur throughout the project lifecycle, implementation of the Marine Biosecurity Plan, adherence to ballast water management requirements and biosecurity controls will minimise the likelihood of introduction and establishment of INNS. The project-alone assessment identified a negligible magnitude of effect across all project phases and, Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
EMF from subsea electrical cabling	X	✓	X	EMF effects are only anticipated during the O&M phase. Available evidence indicates that EMF effects are highly localised, behavioural responses are limited, and there is no clear evidence of biologically significant effects at population or community levels. The EMF effects are restricted to the O&M phase and are not anticipated during construction or decommissioning. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Thermal emissions from operational cables	X	✓	X	Thermal effects are only anticipated during the O&M phase. Available evidence indicates that thermal effects are highly localised, with temperature increases expected to be minimal and below levels associated with significant ecological effects. The thermal effects are restricted to the O&M phase and are not anticipated during construction or decommissioning. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Colonisation of hard structures	X	✓	X	Colonisation of hard structures is considered during the O&M phase only, as it results from the long-term presence of artificial hard substrate on the seabed. While some initial colonisation may occur during construction, the development of established benthic communities and any associated artificial reef effects are more likely to occur during the O&M phase. Any resulting changes are expected to be highly localised and largely restricted to the immediate vicinity of installed infrastructure. Decommissioning may remove communities established during operation; however, this is considered a separate effect. The colonisation of hard structures is principally an O&M phase effect. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Removal of hard substrates	X	X	✓	Removal of hard substrate is only anticipated during the decommissioning phase. Any effects are expected to be highly localised and relate to the loss of artificial habitat, associated benthic communities and any localised reef effects that may have developed on project infrastructure during operation. Following removal, habitats are expected to revert towards baseline soft-sediment conditions. The	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				removal of hard substrate is restricted to the decommissioning phase, Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Receptor-led effects					
Fish and shellfish receptors may be exposed to multiple project-related effects throughout the construction, O&M and decommissioning phases. These effects have the potential to overlap spatially and temporally for some receptors. However, the majority of effects are predicted to be localised, temporary and reversible, with impacts such as temporary habitat disturbance, increased SSC and associated deposition, and underwater sound being limited in extent and duration. Operational effects associated with EMF and thermal emissions are also highly restricted to the immediate vicinity of installed cables. Taking account of the findings of the individual assessments and embedded mitigation measures, no materially greater effect on fish and shellfish receptors is anticipated as a result of these interactions and no significant receptor-led inter-related effects have been identified.					

Table 5.10: Marine mammals - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Injury and disturbance from underwater sound produced by cable installation, O&M, and removal activities	✓	✓	✓	Elevated underwater sound from vessel use and other underwater sound-producing activities, including cable installation, maintenance and repair, and removal activities, could occur across different phases of the MHPGC Project. The potential for these effects to interact across the Project’s lifetime has therefore been considered. The greatest potential for underwater sound effects is expected during construction, associated with cable installation activities and vessel use, while sound generated during the O&M and decommissioning phases, would be expected to be more limited in scale and duration. Although underwater sound effects occurring within different phases could be considered additive where there is temporal overlap, the activities associated with each phase are separated in time and sound-	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				producing activities within each phase will be intermittent. with periods between activities during which MHPGC Project-related underwater sound will cease. Sustained or overlapping exposure across phases is therefore not expected, limiting the potential for effects to interact and result in a greater magnitude. The occurrence of underwater sound effects during more than one MHPGC Project phase is therefore not anticipated to result in an effect of greater significance than that identified for the individual phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Injury and disturbance from underwater sound produced by site investigation surveys	✓	✓	✓	Site investigation surveys may occur during more than one phase of the MHPGC Project and could therefore contribute to the overall temporal duration of underwater sound disturbance over the MHPGC Project lifetime. Although effects occurring across phases could be considered additive where there is temporal overlap, site investigation activities would comprise discrete, short-term survey events, with periods of cessation of sound between activities. The separation between survey events and phases is therefore expected to limit the potential for prolonged, overlapping or continuous exposure, providing opportunities for periods of recovery and for marine mammals to move away from affected areas. Site investigation activities occurring across more than one MHPGC Project phase are therefore not anticipated to result in an effect of greater significance than that identified for the individual phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Injury and disturbance from underwater sound produced by UXO clearance	✓	X	X	Whilst underwater sound-producing activities could occur during all phases of the MHPGC Project, UXO clearance would be undertaken during the pre-construction phase only. There is therefore no potential for UXO clearance effects to interact across the construction, O&M and decommissioning phases and no MHPGC Project lifetime inter-related effect is anticipated from UXO clearance. During pre-construction, UXO clearance could occur in temporal proximity to other underwater sound-producing activities, including	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				site investigation activities. It should be noted however, that for each UXO clearance, the duration of each event, including mitigation, would be very short, with breaks between UXO clearance events providing opportunities for periods of recovery. In accordance with the current UK Joint Position Statement (UK Government, 2025) and supporting guidance, low-noise methods of UXO clearance are the default proposed approach, where practicable, with high order detonation considered only where low order clearance is not feasible. UXO clearance effects occurring during the pre-construction phase are therefore not anticipated to result in an effect of greater significance than that identified for the individual UXO clearance activities. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Impacts on marine mammals due to changes in prey availability	✓	✓	✓	Fish and shellfish communities may be affected during all phases of the MHPGC Project and could therefore provide an indirect pathway for effects on marine mammals through changes in prey availability. Although effects occurring across all phases could be considered additive, the potential for these effects to interact and result in a greater magnitude is limited by the spatial extent and duration of the predicted effects on fish and shellfish communities. The potential effects on fish and shellfish communities are not anticipated to be significant across all phases of the MHPGC Project. Marine mammals are able to exploit a range of prey species and alternative foraging areas, while the area potential affected represent a small proportion of available foraging habitat in the North Sea. Changes in prey availability occurring across more than one MHPGC Project phase are therefore not anticipated to result in an effect of greater significance than that identified for the individual phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Injury to marine mammals due to collision with vessels	✓	✓	✓	Vessel activity throughout the construction, O&M and decommissioning phases of the MHPGC Project would result in a potential risk of collision with marine mammals. Although collision risk	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				vessels could therefore occur across multiple phases, the potential for effects to interact across the MHPGC Project's lifetime is limited by the intermittent nature of vessel activity and the low likelihood of collision. If injury from collision did occur, this could lead to mortality of individuals, but is unlikely to result in population-level effects. The risk of vessel collision would be reduced through vessel management measures, including adherence to the good practice code of conduct for vessel operators secured through relevant MHPGC Project-specific management plans (i.e. the Vessel Traffic Management Plan (VTMP; CoT30) and MMMP (CoT36). Although vessel activity and underwater sound may occur concurrently, the effects are not considered to be additive in relation to collision risk. Marine mammal avoidance responses to vessels and underwater sound may reduce the likelihood of close vessel interactions, while the vessel management measures would further reduce the risk of vessel collision. The potential for injury from collision occurring across more than one MHPGC Project phase is therefore not anticipated to result in an effect of greater significance than that identified for the individual phases. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Receptor-led effects					
Stressor 1: Injury or disturbance from elevated underwater sound (from cable installation, UXO clearance, site investigation surveys, vessels)					
A number of MHPGC Project activities have the potential to generate elevated underwater sound, including site investigation surveys, cable installation activities, UXO clearance and vessel movements. These activities may occur within the same broad area and, particularly during pre-construction and construction, may occur in temporal proximity. There is therefore potential for multiple sound-producing activities to contribute to the spatial extent or duration of disturbance to marine mammals. Where activities occur consecutively, disturbance could persist over a longer period, while activities occurring simultaneously in different locations could result in a larger area being affected at any one time. The potential for such effects to be additive will depend on the timing, location and relative magnitude of the individual sound sources. Evidence from marine mammal responses to anthropogenic underwater sound indicates that behavioural responses can vary according to the characteristics and received level of the sound, as well as the species and context in which exposure occur (Southall et al., 2021). For example, studies of harbour porpoise (<i>Phocoena phocoena</i>) have demonstrated changes in distribution and foraging behaviour in response to anthropogenic sound, including vessel activity and other construction-related noise (Benhemma-Le Gall et al., 2021; 2023). The potential for multiple sound sources to result in an increased					

Impact	Phase			Likely significant inter-related effects	Inter-related	
	C	O	D			
disturbance effect therefore cannot be excluded where activities occur concurrently or consecutively. However, the sound-producing activities associated with the MHPGC Project will generally be intermittent and localised, with periods of cessation between discrete activities. Where activities of substantially different source levels occur concurrently, the higher-level source is expected to dominate the resulting sound exposure, such that lower-level sources are unlikely to materially increase the potential for auditory injury. For disturbance, there is greater potential for spatial or temporal addition; however, the temporary nature of the activities and the mobility of marine mammals are expected to limit the duration and severity of any combined response.						
The potential for auditory injury associated with relevant underwater sound-producing activities will be managed through the mitigation measures secured through the MMMP (CoT36), including measures applicable to UXO clearance. The Outline Offshore Environmental Management Plan (OEMP) (CoT06) will provide the overarching framework for implementation of relevant environmental mitigation and management measures. Taking account of the proposed mitigation and the characteristics of the individual sound sources, the interaction between underwater sound effects is not anticipated to result in effects of greater significance than those assessed for the individual activities.						
Stressor 2: Injury to marine mammals due to collision with vessels						
Vessel movements associated with the MHPGC Project will occur during all phases (construction, O&M and decommissioning) and therefore represent a potential collision risk over more than one phase of the MHPGC Project. The interaction between vessel movements and other marine mammal stressors, particularly underwater sound, could influence the likelihood of close vessel interactions, although the nature and strength of any response will vary between species and individuals and may be influenced by vessel characteristics and habituation to vessel activity. Underwater sound generated by vessels provides a cue to approaching marine mammals and may result in avoidance behaviour, potentially reducing the likelihood of collision. Studies of marine mammal responses to approaching vessels have demonstrated changes in behaviour in response to vessel presence and associated noise, including changes in vocalisation and movement behaviour (e.g. Nowacek <i>et al.</i> , 2001; Buckstaff, 2004).						
The collision risk associated with the MHPGC Project is expected to remain low due to the nature and scale of the proposed vessel activity and the vessel management measures that will be implemented through the Outline VTMP (CoT30) and the MMMP (CoT36). Taking account of these measures, interactions between vessel movements, underwater sound and other MHPGC Project-related stressors are not anticipated to result in an increased risk of injury or mortality beyond that assessed for vessel collision alone.						
Stressor 3: Impacts on marine mammals due to changes in prey availability						
Changes in fish and shellfish communities could provide an indirect pathway for effects on marine mammals and may interact with direct effects such as disturbance from underwater sound. While marine mammals displaced by underwater sound may temporarily experience reduced access to local foraging areas, the availability of alternative foraging habitat and prey resources in the North Sea, together with the mobility of marine mammal receptors, is expected to limit the potential for localised changes in prey availability to exacerbate the effects of disturbance. The assessment presented in Volume 2, Chapter 4: Fish and Shellfish Ecology, of the PEIR , considers the potential effects of multiple stressors on fish and shellfish communities, including those associated with underwater sound, habitat disturbance and increased SSC. Any resulting changes in prey resources are expected to be localised and, where temporary effects occur, reversible. Therefore, potential for indirect effects on marine mammals through changes in prey availability is therefore not anticipated to result in an effect of greater significance than that assessed for the individual impact pathway.						
Multiple stressors: Inter-related effect of all stressors						

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
The potential for the three marine mammal stressors identified above to interact has been considered in relation to their spatial and temporal overlap, the pathways through which effects may occur, and the ability of marine mammal receptors to avoid or recover from localised disturbance. Marine mammals may be exposed to multiple anthropogenic stressors simultaneously or sequentially, although evidence for predicting the consequences of stressor interactions remains limited (Hague <i>et al.</i>, 2022). Ecosystem modelling indicates that interactions between stressors can amplify adverse effects, particularly where stressor magnitude increases, and that higher trophic level organisms, including marine mammals, may be negatively affected (Arrigo <i>et al.</i>, 2020). The interaction of multiple underwater sound sources (Stressor 1) will depend on their relative magnitude, timing and location. Concurrent or sequential sound-generating activities may increase the duration or extent of disturbance; however, where sources overlap, the dominant source is expected to govern received exposure levels. As such, any combined response is unlikely to be materially greater than that assessed for individual sound sources. Interactions between underwater sound and vessel activity (Stressors 1 and 2) have also been considered. Vessel noise may act as a cue for avoidance behaviour, potentially reducing the likelihood of close vessel interactions, while also contributing to overall disturbance. Given the low vessel collision risk identified for the MHPGC Project and the mitigation measures to manage vessel activity, this interaction is not expected to increase the risk of injury or mortality. Changes in fish and shellfish communities may provide an indirect pathway linking underwater sound and prey availability (Stressors 1 and 3). While reductions in prey availability could increase the consequences of disturbance for displaced animals, project-related effects on fish and shellfish communities are not expected to substantially restrict prey resources across the wider foraging range available to marine mammals. The potential for these stressors to combine and produce a materially greater effect is therefore considered limited. Evidence from offshore wind farm monitoring demonstrates reductions in marine mammal presence associated with disturbance can be temporary, with recovery observed following cessation or reduced disturbance (e.g. Tougaard <i>et al.</i>, 2003; Teilmann <i>et al.</i>, 2006; Graham <i>et al.</i> 2019). For the MHPGC Project, the generally intermittent and localised nature of activities, combined with the availability of alternative habitat and prey resources, is expected to limit the potential for temporary inter-related effects to result in longer-term consequences. Overall, although interactions between the identified stressors are possible, the potential for amplification of effects is limited by the spatial and temporal characteristics of MHPGC Project activities, their intermittent nature, the mobility of marine mammal receptors, the availability of alternative habitat and prey resources, and embedded mitigation measures. Accordingly, inter-related effects are not anticipated to result in a greater magnitude or significance of effect than that identified for the individual impact pathways.					

Table 5.11: Marine ornithology - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Disturbance and displacement from airborne noise, underwater noise and visual disturbance associated with the presence of vessels.	✓	✓	✓	Disturbance and displacement from airborne noise, underwater noise and visual disturbance associated with the presence of vessels will occur during the construction and decommissioning phase of the MHPGC Project. There is less potential for disturbance and displacement in the O&M phase due to the reduced vessel activity. The intermittent, short-term and highly localised impacts will primarily occur in the construction and decommissioning phase, therefore cumulative effects are predicted to be no greater in significance than the impacts assessed individually over the lifetime of the MHPGC Project. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Indirect impacts from underwater noise affecting prey species from vessels.	✓	✓	✓	Indirect impacts from underwater noise affecting prey species will primarily occur during the construction and decommissioning phase of the MHPGC Project. There is less potential for disturbance and displacement in the O&M phase due to the reduced vessel activity. The intermittent, short-term and highly localised impacts will primarily occur in the construction and decommissioning phase, therefore cumulative effects are predicted to be no greater in significance than the impacts assessed individually over the lifetime of the MHPGC Project. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Temporary habitat loss/disturbance from increased SSCs, including indirect impacts on prey species.	✓	✓	✓	The increase in SSC resulting in temporary habitat loss/ disturbance to marine ornithology receptors including indirect impacts on prey species will primarily occur during the construction and decommissioning phase of the MHPGC Project. The intermittent, short-term and highly localised impacts will primarily occur in the construction and decommissioning phase, therefore cumulative effects are predicted to be no greater significance than the impacts assessed individually over the lifetime of the MHPGC Project. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Marine Ornithology receptors identified for receptor led effects include seaducks (common eider, common scoter, velvet scoter, long-tailed duck), red-breasted merganser, auks (guillemot, razorbill and puffin), terns (sandwich tern, Arctic tern, common tern, roseate tern), divers (great norther diver, red-throated diver, black-throated diver) and shag. These species were assessed for all impact pathways listed above and as such are vulnerable to multiple simultaneous effects. However, the magnitude for all impact pathways listed above are intermittent, highly localised and short term in nature, with Marine Ornithology receptors able to locate suitable alternative habitat, based on their own foraging range or due to the availability of suitable habitat within the nearby area. Furthermore, the secondary effects from underwater noise and increase SSC to benthic, fish and shellfish receptors have been discussed within their own chapters. No significant effect on these receptors was concluded as such no secondary effects are considered. Therefore, the significance of effect is considered to be minor, which is not significant in EIA terms.					

Table 5.12: Commercial fisheries - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Loss or restricted access to fishing grounds	✓	✓	✓	No likely significant project-lifetime inter-related effects are expected. Temporary restrictions on access will move progressively along the cable route during construction and are expected to be similar during decommissioning. During operation and maintenance, fishing is assumed to resume after cable burial, with localised and intermittent restrictions arising only during cable repair or remediation and around any permanent cable protection. Although repeated operation and maintenance interventions may affect the Farn Deeps Nephrops ground, the effects occur at different times and access will be restored after each activity. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Displacement of fishing activity to other areas	✓	✓	✓	No likely significant project-lifetime inter-related effects are expected. Displacement is linked to temporary loss of access around active works. It will be localised during construction and decommissioning and intermittent during operation and maintenance, when repair or remediation may cause short-term redistribution of effort. Fishing activity is expected to return after each activity, so displacement pressures will not persist continuously or accumulate across the	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				MHPGC Project lifetime. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Interference with fishing activity	✓	✓	✓	No likely significant project-lifetime inter-related effects are expected. Interference will arise from project-related vessel movements and the presence of vessels at active work locations. It will be temporary during construction and decommissioning and intermittent and localised during operation and maintenance. Advance notification, marine coordination, compliance with the International Regulations for Preventing Collisions at Sea and ongoing fisheries liaison will allow fishing vessels to plan around the works. Because the activities in each phase are separated in time and any interference ends when vessels leave the area, therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Increased steaming distances and times	✓	✓	✓	Additional steaming may be required locally around active construction and decommissioning works. During normal operation there will be no fixed surface infrastructure or exclusion area that would alter established transit routes; any additional steaming associated with repair or remediation will be temporary and confined to discrete locations. These effects will not occur continuously and are not expected to combine across phases therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Snagging risk – loss or damage to fishing gear	✓	✓	✓	Potential snagging hazards differ between phases. During construction and decommissioning they relate to temporary seabed works, open trenches and partly installed or removed infrastructure. During operation and maintenance they are limited to localised cable exposure or cable protection. Cable burial and integrity monitoring, remediation, charting and communication with the fishing industry will reduce the likelihood and persistence of hazards. As the potential hazards are localised, intermittent and managed throughout the MHPGC Project lifetime, therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Impacts on commercially exploited species	✓	✓	✓	Construction and decommissioning may cause temporary seabed disturbance, sediment mobilisation and local redistribution of commercially important fish and shellfish. During operation and maintenance, comparable effects would arise only intermittently from cable inspection, repair or remediation. The effects are expected to be localised and reversible, and the key commercial species occur across the wider North Sea. Recovery between activities means that effects over the MHPGC Project lifetime are not expected to combine into a long-term reduction in the availability or productivity of commercially exploited stocks. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					
A receptor-led inter-related effect could arise where restrictions on access displace fishing activity and also cause interference or additional steaming. This is most relevant to the Nephrops trawl and potting fisheries during active construction, maintenance and decommissioning works. These effects share the same temporary and localised source and will cease when the relevant works are complete. Advance notification (CoT04), ongoing fisheries liaison (CoT19), the Fisheries Liaison and Coexistence Plan and Fisheries Mitigation and Monitoring Plan (CoT20), and evidence-based mitigation including justifiable disturbance payments where relevant will reduce the combined effect. Reduced access and displacement effects on the Nephrops trawl fleet remain moderate adverse, with mitigation being explored, and the inter-related effects are not expected to increase the significance of these effects beyond that assessed individually. Snagging risk and temporary disturbance of commercially exploited species are assessed as minor adverse and are not expected to add materially to the access and displacement effects. The receptor-led inter-related effect is therefore not expected to be greater than the residual effects assessed individually.					

Table 5.13: Shipping and Navigation- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Increased vessel to vessel collision risk (third-party to MHPGC Project vessel)	✓	✓	✓	For each phase, this impact will occur only where activities involving a MHPGC Project vessel is required. In all instances (whether installation, routine surveys, remedial works or decommissioning) the activity will be localised and short-term in nature. Therefore, there is	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				no pathway for effects to accumulate across project phases or over the project lifetime.	
Increased vessel to vessel collision risk (third-party to third-party)	✓	✓	✓	For each phase, this impact will occur only where activities involving a MHPGC Project vessel is required, with this activity instigating the need for third-party vessels to deviate resulting in increased collision risk. However, as above, in all instances (whether installation, routine surveys, remedial works or decommissioning) the activity involving a MHPGC Project vessel will be localised and short-term in nature. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Reduced access to local ports and harbours	✓	✗	✓	This impact is scoped out for the O&M phase since large vessel movements will be limited and disruption to port access is anticipated to be minimal. During the construction and decommissioning phases, the impact will be localised to ports and harbours close to landfall or where routes to and from a port cross the MHPGC PEIR Red Line Boundary. However, the impact will only occur whilst MHPGC Project vessels are present in these areas which will be intermittent. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Disruption to fishing and recreational activities	✓	✗	✓	This impact is scoped out for the O&M phase since large vessel movements will be limited and disruption to fishing and recreational activities is anticipated to be minimal. During the construction and decommissioning phases, the impact will be localised and only occur temporarily where construction or decommissioning activities are ongoing. Therefore, cumulative changes over the lifetime of the MHPGC Project are not expected to result in a measurably greater change than for those assessed for each individual phase.	No project lifetime inter-related effects identified.
Disruption to third-party marine activities	✓	✓	✓	For dredging activities, the proximity of the MHPGC PEIR Red Line Boundary to a spoil ground associated with the Port of Seaham means that the impact will be present throughout all phases. However, following the refinement of the MHPGC PEIR Red Line Boundary to avoid this spoil ground, disruption is expected to be very limited and manageable via appropriate communication between vessels and	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				promulgation of information. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Reduction of under keel clearance	✓	✓	✓	Once external cable protection is installed during the construction phase this impact will be present throughout all phases. However, the extent of the protection is not expected to change (up to 2m above seabed) once installed. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Anchor interaction with subsea cables	✓	✓	✓	Once cable lay occurs during the construction phase this impact will be present throughout all phases. The extent of the impact could increase as the project lifetime progresses should exposures to the cable develop. However, given that the Cable Burial Risk Assessment (CBRA) will define burial depths and safeguards to keep the offshore export cables protected and compliant throughout all phases, including monitoring of the cables, the cumulative changes over the lifetime of the MHPGC Project are not expected to result in a measurably greater change than for those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	Should exposures occur over the project lifetime this impact may be exacerbated although this is mitigated against through the CBRA embedded commitment – therefore the significance of effect for the project lifetime is considered to be broadly acceptable in Scottish waters and tolerable with mitigation in English waters (both not significant in EIA terms), as per the individual phases.
Fishing gear interaction with subsea cables	✓	✓	✓	Once cable lay occurs during the construction phase this impact will be present throughout all phases. The extent of the impact could increase as the project lifetime progresses should exposures to the cable develop. However, given that the CBRA will define burial depths and safeguards to keep the offshore export cables protected and compliant throughout all phases, including monitoring of the cables,	Should exposures occur over the project lifetime this impact may be exacerbated although this is mitigated against

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				the cumulative changes over the lifetime of the MHPGC Project are not expected to result in a measurably greater change than for those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	through the CBRA embedded – therefore the significance of effect for the project lifetime is considered to be tolerable with mitigation in Scottish waters and broadly acceptable in English waters (both not significant in EIA terms), as per the individual phases.
Interference with navigation, communications and position-fixing equipment	✓	✓	X	During the construction phase this impact will only occur whilst the offshore export cables are energised which is only anticipated during testing. The magnitude of the effect will be consistent across the construction and O&M phases and therefore the cumulative changes over the lifetime of the MHPGC Project are not expected to result in a measurably greater change than for those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Receptor-led effects					
Third-party vessels may be displaced due to the presence of MHPGC Project vessels during activities. In such circumstances vessels will be exposed to both forms of collision risk identified as impacts (third-party to MHPGC Project vessel and third-party to third-party) and this displacement could also contribute to other impacts including reduced access to local ports and harbours, disruption to fishing and recreational activities, and disruption to third-party marine activities. However, there are embedded commitments, as described within Volume 1, Annex 4.1: Draft commitments register, of the PEIR, which are relevant across all of these impacts most notably the advanced warning of activities. This will ensure that third-party vessels are aware in advance of activities and can passage plan accordingly so as to minimise the combined effect across these impacts. Therefore, the receptor-led inter-related effect is not expected to be greater than the individual effects per impact.					

Table 5.14: Marine and Intertidal Archaeology- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Potential direct impacts on marine and intertidal archaeology receptors resulting in damage or loss.	✓	✓	✓	The potential for direct impacts to marine and intertidal archaeology receptors are likely greater during the construction phase than during the O&M and decommissioning phases. Where O&M/decommissioning impacts occur within the footprint of construction impacts, it is anticipated that no greater impact will be experienced than has previously occurred (during the construction phase). Direct impacts would be activity- and phase-specific and would not persist across phases. Direct impacts may, however, occur individually within each phase. With the application of the embedded mitigation measures (CoT63 and CoT64), the significance of effects for the project lifetime are not expected to exceed negligible or minor adverse, or minor adverse, as assessed for each individual phase. Under commitment measure CoT64, an Outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be submitted outlining the mitigation measures for archaeological receptors. Known archaeological remains of high significance will be protected by Archaeological Exclusions Zones (AEZs) or Temporary Exclusion Zones (TAEZs), within which no activities will take place, removing the pathways for potential for direct impacts. The Outline WSI and PAD will also include a rationale for operational awareness of geophysical/magnetic anomalies identified as having a low archaeological potential and any necessary reporting requirements should material of potential archaeological interest be encountered, and for archaeological input into specifications and archaeological analysis of further pre-construction surveys. The latter will also reduce the risk that hitherto unknown archaeological remains will remain undetected and allow more detailed analysis of palaeoenvironmental remains to determine their archaeological potential, allowing for staged process of geoarchaeological works, as necessary. The risks	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				to unknown archaeological remains will also be reduced through adherence to the PAD which will detail a process for the reporting of unexpected discoveries of potential archaeological interest and the subsequent steps to be taken. The Outline WSI and PAD will be revised to a Full Offshore WSI and PAD at the post-consent stage, to align archaeological mitigation measures and methodologies with consented activities. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Potential indirect impacts on marine and intertidal archaeology receptors resulting in damage or loss.	✓	✓	✓	The pathway for potential indirect impacts to marine and intertidal archaeology receptors is represented by increases in SSC (and subsequent deposition), which will occur during the construction, O&M and decommissioning phases of the MHPGC Project. The spatial extent of meaningful seabed disturbance and associated increases in SSC and deposition is expected to be localised, mainly within the near-field and intermediate impact zones of the activity (up to 500m). With the application of the embedded mitigation measures (CoT63 and CoT64), the significance of effects for the project lifetime are not expected to exceed negligible or minor adverse, or minor adverse, as assessed for each individual phase. Under commitment measure CoT64, an Outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be submitted outlining the mitigation measures for archaeological receptors. The risk of indirect impact to geophysical anomalies of low potential and magnetic anomalies and unknown archaeological remains will be reduced by the involvement of an archaeologist during the planning of any future surveys/activities, to ensure that requirements for marine and intertidal are upheld and specifications can consider the collection of additional data to improve understanding of identified anomalies and wrecks. A rationale for such involvement is included within CoT64. New and improved understanding of this receptor may be used to establish new AEZs and/or alter existing AEZs (through discussion with stakeholders) to minimise potential for impacts. The risk to these receptors will be further reduced through operational awareness of their location. The risks to unknown archaeological remains will also	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				be reduced by archaeological involvement in future surveys as detailed above, and in addition, through adherence to the PAD which will detail a process for the reporting of unexpected discoveries of potential archaeological interest and the subsequent steps to be taken. These mitigation measures will also reduce the risk to palaeoenvironmental remains, along with an additional measure outlined within CoT64 for the archaeological review and implementation of a staged process of geoarchaeological works of any future cores obtained, as necessary. The Outline WSI and PAD will be revised to a Full Offshore WSI and PAD at the post-consent stage, to align archaeological mitigation measures and methodologies with consented activities. Application of these measures will reduce potential direct impacts to all receptors to either minor adverse, or negligible or minor adverse, which are not significant in EIA terms. Other factors will also contribute to the reduction of the significance of project lifetime effects. The highest increase in SSC will occur during the construction phase, presenting the greatest potential for indirect impacts to occur to marine and intertidal archaeology receptors. A lesser increase in SSC and associated lesser potential for indirect impacts is considered for the O&M and decommissioning phases. Furthermore, the absence of a temporal overlap between phases presents the potential for sediment deposited by previous phase activities to be naturally reduced by marine processes closer to baseline conditions. This reduction in the potential overburden of deposited sediments would decrease the potential for indirect impacts. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Receptor-led effects					
Spatial and temporal interaction of MHPGC Project activities within and across phases may result in both direct and indirect impacts to marine and intertidal archaeology receptors. The greatest potential for such receptor-led effects may occur through two scenarios: combined effects on one or more receptor; and the interaction between direct and indirect impacts on a single receptor. Embedded mitigation commitments (CoT63 and CoT64) will minimise the potential for combined effects to result in impacts (direct or indirect) to multiple marine and intertidal archaeology receptors. For example, the establishment of AEZs will prevent any direct impacts from occurring to known or unknown					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
receptors within. Any inter-related effect would be no greater than those concluded from individual assessments (i.e. minor adverse, or negligible or minor adverse). Embedded mitigation commitments (CoT63 and CoT64) will also minimise the potential for direct and indirect impacts to affect the same receptor. The establishment of AEZs around known archaeological sites and high or medium potential geophysical anomalies will remove the pathway for direct impacts and either remove the pathway or reduce the magnitude of indirect impacts to a significance of effect no greater than that concluded from the individual assessment (i.e. minor adverse). Any inter-related effect would also be no greater than minor adverse for this receptor. Mitigation for low potential geophysical anomalies, magnetic anomalies, and unknown archaeological sites includes archaeological input into any future surveys and review of acquired data, the production of activity-specific Method Statements, and adherence to the PAD. These measures will help to implement other mitigation, as necessary (such as the establishment of additional AEZs), and either remove the pathway or reduce the magnitude of direct and indirect impacts to a significance of effect no greater than that concluded from the individual assessment (i.e. minor adverse). Any inter-related effect would also be no greater than minor adverse for these receptors. No potential indirect impact pathway has been identified for sub-seabed deposits of geoarchaeological potential, therefore, no inter-related effects involving both direct and indirect impacts are anticipated for this receptor.					

Table 5.15: Infrastructure and Other Sea Users- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Impact on marine disposal sites	✓	✓	✓	Temporary restrictions on access to marine disposal sites may occur during construction, O&M and decommissioning activities due to increased vessel activity associated with the MHPGC Project. However, these interactions would remain localised, intermittent and reversible, and disposal operations would not be prevented from taking place. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Displacement of recreational activities (including recreational sailing, cruising and recreational fishing)	✓	✓	✓	The displacement of recreational activities, including recreational sailing, cruising and recreational fishing, may occur during construction, operation and maintenance, and decommissioning activities as a result of advisory safe passing distances associated with project vessels and infrastructure. The impact is predicted to be localised in the context of the extensive recreational area available within the North Sea and would be intermittent in nature. Whilst the	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				impact is present across all project phases, operation and maintenance effects are predicted to be lower than those experienced during construction and decommissioning. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Impacts to early development cables or pipelines or restrictions on access to operational cables or pipelines	✓	✓	✓	Impacts to early development cables or pipelines, or restrictions on access to operational cables or pipelines, may occur during construction, operation and maintenance, and decommissioning activities. Temporary access restrictions may arise during installation and decommissioning activities, whilst operational interactions would be managed through crossing and proximity agreements, navigational notifications and liaison with asset owners. The impact is expected to remain low adverse throughout all project phases and, due to the short-term and managed nature of activities, cumulative changes over the lifetime of the MHPGC Project are not expected to result in a materially greater effect than those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Disruption to military training activities	✓	✓	✓	Disruption to military areas may occur during construction, O&M, and decommissioning activities as a result of project vessel movements within, or in proximity to, areas used for military training activities. Any interactions would remain temporary, intermittent, localised and reversible, and would not prevent military training activities from taking place or affect the functionality of military practice areas. The impact is expected to remain low adverse throughout all project phases and, therefore, cumulative changes over the lifetime of the MHPGC Project are not expected to result in a materially greater effect than those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	No project lifetime inter-related effects identified.
Increased SSC and associated deposition affecting non-documented recreational diving sites	✓	✓	✓	Increased SSC and associated deposition affecting non-documented recreational diving sites may occur during construction, O&M, and decommissioning activities. However, any increases in SSC would be temporary, localised and reversible, and subject to natural dispersion	No project lifetime inter-related effects identified.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				processes. Recreational diving activity is anticipated to be concentrated within accessible nearshore waters, whilst offshore project activities are generally located in areas less conducive to recreational diving. As a result, any reductions in water clarity would be short term and confined to the vicinity of works. Therefore, cumulative changes over the lifetime of the MHPGC Project are not expected to result in a materially greater effect than those assessed for each individual phase. Therefore, there is no pathway for effects to accumulate across project phases or over the project lifetime.	
Receptor-led effects					
Potential exists for spatial and temporal interactions between impacts on infrastructure and other marine users. For example, recreational users may experience temporary displacement from project activities alongside restrictions associated with increased vessel activity, whilst infrastructure operators may experience temporary restrictions on access to assets. However, the identified impacts are generally temporary, localised, intermittent and reversible in nature, and would be managed through embedded mitigation and standard industry practices. As the individual effects are assessed as negligible adverse, negligible to minor adverse, or minor adverse and are not significant in EIA terms, these impacts are not anticipated to interact in a way that would result in a greater receptor-led inter-related effect. Therefore, the receptor-led inter-related effects are not expected to be greater than the individual effects identified within the topic-specific assessments.					

5.5.3 Assessment of Onshore inter-related effects

Table 5.16: Geology, Hydrogeology and Ground Conditions- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Permanent loss of or damage to locally or nationally important geological features	✓	✗	✗	Permanent loss or damage to geological features would occur only during construction activities associated with excavation, earthworks and installation of infrastructure. As no operational or decommissioning effects are anticipated on these receptors, there is no potential for project lifetime effects.	No change resulting from inter-related effects.
Temporary loss of access to geological features with statutory conservation designations	✗	✗	✗	Temporary restrictions to geological features may occur during both construction and decommissioning. However, these activities would not overlap temporally. The effects are temporary and reversible, therefore there is no potential for project lifetime effects.	No change resulting from inter-related effects.
Temporary sterilisation of mineral resources due to construction activities and permanent sterilisation associated with operational infrastructure	✓	✓	✓	Temporary sterilisation of mineral resources may occur during construction and decommissioning through the presence of temporary compounds and working areas, whilst permanent sterilisation may arise during operation due to retained infrastructure. Although effects may occur across multiple phases, they relate to different activities and timescales and are already captured within the individual assessments. Consequently, no project lifetime effects greater than those identified for individual phases are anticipated.	No change resulting from inter-related effects.
Release of contaminants to the ground, groundwater or surface water due to accidental spills or leaks of chemicals, fuels or oils from vehicles, plant or temporary storage facilities, release of contaminants from wastes or other temporarily stored or stockpiled materials by run-off or windblown dust.	✓	✗	✓	Potential contamination effects may arise during construction and decommissioning through accidental spills, leaks, contaminated run-off and disturbance of contaminated ground. Construction and decommissioning activities would be temporary and temporally separate. In accordance with embedded mitigation (CoT18, CoT24, CoT33) and pollution prevention measures (CoT21, CoT34), these effects are not anticipated to interact to result in effects greater than those identified within the individual phase assessments.	No change resulting from inter-related effects.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Mobilisation of contamination by foundation construction (e.g., piling) during construction.					
Changes to the level of risk from contaminated land where the MHPGC Project interacts with existing land contamination (e.g. removal of vegetation, ground reprofiling, removal of hardstanding). Potential for buried cable routes to act as a preferential pathway for migration of mobile contaminants.	✓	✗	✗	Potential effects may occur during operation and decommissioning through the interaction of infrastructure with existing contaminated land and changes to contaminant migration pathways. These effects would be localised and controlled through the implementation of embedded mitigation measures (CoT62). Consequently, no project lifetime effects greater than those assessed within the individual phases are anticipated.	No change resulting from inter-related effects.
Potential for the subsurface equipment required for the operation of the MHPGC, including the buried cables, to introduce new potential sources of contamination.	✗	✓	✓	Potential contamination risks associated with buried infrastructure may occur during operation and decommissioning. Appropriate design measures (CoT62) and management controls would minimise the likelihood of contamination occurring. The effects identified are not anticipated to interact in a manner that would increase significance beyond that reported within the individual phase assessments.	No change resulting from inter-related effects.
Accumulation of mine gas within enclosed spaces at the green land substation (LSS) option leading to potentially toxic and/or explosive atmospheres in enclosed spaces.	✗	✓	✗	Potential effects associated with mine gas accumulation are limited to the O&M phase. As no construction or decommissioning effects are identified, there is no potential for project lifetime effects.	No change resulting from inter-related effects.
The potential impacts of thermal emissions from buried high voltage cables on groundwater bodies.	✗	✓	✗	Potential effects associated with thermal emissions from buried cables would occur only during operation and maintenance. As there are no equivalent construction or decommissioning effects, there is no potential for project lifetime effects greater than those assessed within the operational phase.	No change resulting from inter-related effects.
Impacts on groundwater levels and flow, (e.g., at watercourse crossings, at excavations requiring dewatering).	✓	✗	✓	Temporary impacts on groundwater levels and flow may occur during construction and decommissioning due to excavation and dewatering activities. These activities would not occur concurrently and effects	No change resulting from inter-related effects.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				would be temporary. Therefore, no project lifetime effects are anticipated.	
Potential impacts from over-pumping to the Magnesian Limestone aquifer	✓	X	X	Potential impacts associated with over-pumping of the Magnesian Limestone aquifer are limited to construction activities requiring dewatering. No operational or decommissioning effects are anticipated. Therefore, there is no potential for project lifetime effects greater than those assessed within the construction phase.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects associated with geology receptors through interactions with effects assessed within Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR, Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR, Volume 3, Chapter 9: Agriculture and Soils, of the PEIR, Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR, and Volume 4, Chapter 2: Human Health, of the PEIR. These interactions relate primarily to the disturbance of soils and superficial deposits, changes to groundwater and surface water regimes, increased sediment generation, contamination risks, and temporary land take during construction. Potential interactions with water environment receptors may arise where ground disturbance, excavation and dewatering activities result in changes to groundwater conditions, increased sediment mobilisation or contamination pathways. Similar interactions may occur with Terrestrial Ecology where effects on ecological receptors are associated with changes to ground conditions. Potential interactions with Soil receptors may occur as a result of soil stripping, handling and storage activities, which may affect both soil resources and underlying geological receptors. Interactions may also occur with residential receptors, non-residential receptors, and Transport receptors through temporary disruption associated with construction activities, increased vehicle movements and disturbance of land. The individual topic assessments identify generally minor adverse or lower residual effects following the implementation of embedded mitigation and good practice measures. Consequently, the interaction of these effects is not considered likely to result in a materially different outcome for geology, hydrogeology and ground conditions receptors than that reported within the individual assessments. Therefore, no additional significant inter-related effects have been identified.					

Table 5.17: Water Resources and Flood Risk - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related Significance
	C	O	D		
Project lifetime effects					
Construction, operation and maintenance, and decommissioning activities resulting in potential impacts on water quality.	✓	✓	✓	Potential effects on water quality may occur during the construction, operation and maintenance, and decommissioning phases. Construction and decommissioning activities may result in temporary sediment mobilisation, contaminated runoff, accidental spillages and changes to water quality, whilst operational effects are associated with the continued presence and maintenance of infrastructure. However, no significant effects on water quality have been identified for any individual phase, and these effects are not anticipated to interact in such a way across subsequent project phases as to result in combined effects of greater significance than those identified within the individual assessments.	No change resulting from inter-related effects.
Construction, operation and maintenance, and decommissioning activities resulting in potential impacts on flood risk.	✓	✓	✓	Potential effects on flood risk may arise during construction, operation and maintenance, and decommissioning through temporary alterations to surface water drainage patterns, watercourse crossings and changes in runoff characteristics. Whilst effects may occur across several project phases, they are localised, temporary or appropriately managed through embedded mitigation and design measures. Consequently, the interaction of effects across the project lifetime is not anticipated to result in effects of greater significance than those identified within the individual phase assessments.	No change resulting from inter-related effects.
Construction and decommissioning activities resulting in potential impacts on water resource availability as a result of consumptive uses of water during construction.	✓	✗	✓	Construction and decommissioning activities may require temporary water use for construction compounds, dust suppression, hydrostatic testing and associated works. These activities would occur at different points in the project lifetime and would not overlap temporally. Accordingly, no project lifetime effects are anticipated.	No change resulting from inter-related effects.
Construction and decommissioning activities resulting in a potential impact on hydromorphology.	✓	✗	✓	Potential effects on hydromorphology may arise during construction and decommissioning through watercourse crossings, excavation works and temporary disturbance to channel features. Construction and decommissioning activities would not occur simultaneously and the identified impacts are temporary in nature. Therefore, no project lifetime effects are anticipated.	No change resulting from inter-related effects.
Receptor-led effects					

Impact	Phase			Likely significant inter-related effects	Inter-related Significance
	C	O	D		
There is potential for receptor-led effects associated with changes to water quality, groundwater levels, groundwater flow and flood risk which may arise through excavation, disturbance of contaminated land and accidental pollution events. These interactions are informed by the assessments presented in Volume 3, Chapter 1: Geology, Hydrogeology and Ground Conditions of the PEIR and Volume 3, Chapter 2: Water Resources and Flood Risk of the PEIR. There is potential for receptor-led effects associated with the changes to groundwater and surface water conditions to influence water-dependent habitats and associated ecological receptors. These interactions are informed by the assessments presented in Volume 3, Chapter 2: Water Resources and Flood Risk of the PEIR, Volume 3, Annex 3.2: Water Framework Directive Assessment, of the PEIR and Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology of the PEIR. There is potential for receptor-led effects associated with soil disturbance, erosion and changes to drainage patterns, which could affect runoff pathways and sediment delivery to watercourses. These interactions are informed by the assessments presented in Volume 3, Chapter 2: Water Resources and Flood Risk of the PEIR and Volume 3, Chapter 9: Agriculture and Soils of the PEIR. There is potential for receptor-led effects associated with accidental spillages, contaminated run-off, or pollution of watercourses during construction and decommissioning, which could affect surface water and groundwater quality and, indirectly, users of drinking water sources and designated bathing waters. The assessment of these risks and the effectiveness of mitigation measures (CoT18, CoT23, CoT33, CoT34) is informed in the Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR and is addressed in Volume 4, Chapter 2: Human Health of the PEIR. Dust generated during construction could be deposited on surrounding land and subsequently washed into nearby watercourses through rainfall and surface runoff, potentially resulting in temporary reductions in water quality. Consequently, there is potential for interrelated effects between dust emissions and surface water hydrology during the construction phase. Embedded mitigation measures (CoT16, CoT18, CoT21) are proposed to ensure the effective management of dust emissions, thereby avoiding adverse effects on surface water receptors. Construction traffic and vehicle movements may increase the risk of accidental spillages entering surface water drainage networks. In addition, construction of haul roads have the potential to alter surface water runoff pathways and influence sediment transport processes. Consequently, there is potential for interrelated effects between construction traffic haul road, and surface water quality during the construction phase. Embedded mitigation measures (CoT18) are proposed in the Volume 3, Chapter 5: Traffic and Transport, of the PEIR to ensure the effective management of construction activities and associated accidental spillages and runoff, thereby avoiding adverse effects on surface water receptors. For the receptor led effects, overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from the inter-related effects.					

Table 5.18: Terrestrial Ecology and Terrestrial and Intertidal Ornithology - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Permanent or temporary land take and land use change, resulting in the loss,	✓	✓	✓	Potential effects on ecological receptors may occur throughout the construction, operation and maintenance, and decommissioning phases of the MHPGC Project. Construction activities may result in temporary and	No change resulting from inter-related effects.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
degradation or modification of habitats and the displacement or loss of fauna				permanent habitat loss, degradation and disturbance, whilst operational effects may arise from the presence of retained infrastructure and habitat management measures. Decommissioning activities may result in temporary habitat disturbance associated with infrastructure removal and reinstatement works. However, the nature and significance of these effects have been assessed within each project phase and are not anticipated to interact in a manner that would result in effects of greater significance than those identified within the individual assessments.	
Fragmentation of habitats, resulting in reduced habitat connectivity, disruption of ecological networks, and obstruction of species movement and migratory pathways	✓	✓	✓	Habitat fragmentation effects may occur during construction through vegetation clearance, installation of infrastructure and temporary working areas, whilst operational effects may arise from the continued presence of permanent infrastructure. Decommissioning activities may result in temporary disruption associated with infrastructure removal and reinstatement. Although ecological receptors may experience effects during multiple phases of the Project, these effects are not anticipated to interact in such a way as to result in effects of greater significance than those assessed within the individual phase assessments.	No change resulting from inter-related effects.
Increased noise, vibration, lighting and human activity during construction and operation, resulting in disturbance, displacement, avoidance behaviour and potential changes to the distribution and behaviour of fauna	✓	✓	✓	Disturbance effects on fauna may arise during construction and decommissioning as a result of noise, vibration, lighting, vegetation clearance, construction traffic and human activity. Operational effects may arise from maintenance activities and the continued presence of infrastructure. Construction and decommissioning activities would occur at different times and operational effects are generally of a different nature and lower intensity. Consequently, the effects identified are not anticipated to interact over the project lifetime to result in effects of greater significance than those reported within the individual assessments.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects on ecological receptors where habitat loss or fragmentation occurs alongside changes in water quality, hydromorphology, groundwater conditions or surface-water flows. Earthworks and watercourse crossings could result in sediment mobilisation, temporary changes to channel form and accidental pollution, which may act on the same ecological receptors affected directly by construction. However, in Volume 3, Chapter 2: Water Resources and Flood Risk of the PEIR, assessment does not identify notable changes to the hydrological regimes of designated biodiversity sites or water-dependent habitats, and the relevant water-environment effects are generally Minor Adverse following mitigation. Accordingly, these interactions are not expected to increase the significance of effects on ecological receptors beyond those reported in the individual chapters. Construction and decommissioning noise, vibration, lighting and movement could occur concurrently with habitat loss and fragmentation, resulting in disturbance or displacement of ecological receptors. These ecological disturbance effects are assessed as Minor Adverse or lower following implementation of the embedded mitigation measures identified within the Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR and is addressed in Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR. Therefore, noise and vibrational effects would not materially increase the significance of effects on ecological receptors.					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Dust and vehicle emissions generated during construction and decommissioning could be deposited on nearby habitats and vegetation at the same time as habitats experience land take, fragmentation or other disturbance. Volume 4, Chapter 7: Onshore Air Quality, of the PEIR concludes that construction and decommissioning dust and traffic-emission effects would be Not Significant following implementation of embedded mitigation (CoT16, CoT18, CoT21). Therefore, air-quality effects would not materially increase the significance of effects on ecological receptors. Increased construction and decommissioning traffic may interact with ecological effects through additional noise, lighting and movement along haul roads and access routes, together with the potential for death or injury of fauna. Traffic movements may also increase the risk of accidental spills entering nearby habitats and watercourses. Vehicle-related mortality or injury has been scoped out on the basis that speed limits would be implemented on construction haul roads and access tracks. Traffic and Transport residual effects are generally Negligible to Minor Adverse and Not Significant as presented in Volume 3, Chapter 5: Traffic and Transport, of the PEIR. The interaction with terrestrial ecology is therefore not expected to result in a significant receptor-led effect. Ground disturbance, excavation, contaminated land and changes to groundwater pathways could interact with habitat loss and pollution effects on terrestrial and aquatic ecological receptors. However, the risk of mobilisation of contaminants and changes to groundwater conditions would be managed through standard construction controls, pollution-prevention measures and, where required, remediation. Following mitigation, the interaction is not expected to increase the significance of ecological effects beyond those identified in the Volume 3, Chapter 1: Geology, Hydrogeology and Ground Conditions, of the PEIR. Temporary changes to public access and recreation could alter human activity within or near ecological habitats. Diversions may reduce disturbance in some locations but could redirect users towards alternative habitats, potentially increasing disturbance to fauna or trampling of vegetation. Permanent land-use changes may also overlap with habitat loss and fragmentation associated with the landfall, cable routes and land substation. These pathways would be managed through access planning, habitat protection measures, fencing and reinstatement as presented in Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR. Across the project lifetime, the effects on 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 PEIR. Therefore, there is no change resulting from the inter-related effects.					

Table 5.19: Onshore Archaeology and Cultural Heritage - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Permanent loss of archaeological remains	✓	✗	✗	Permanent loss of archaeological remains is only anticipated during land preparation activities (earthworks and excavation) in the construction phase. No potential effects are anticipated during the O&M phase. Although there is potential for impacts on archaeological remains during decommissioning, these are considered unlikely as decommissioning would occur within the same footprint as construction, where any archaeological impacts would already have been addressed. Consequently, no project lifetime effects are anticipated.	No change resulting from inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Change within the setting of heritage assets	✓	✓	X	Temporary construction effects associated with the Landfall and Onshore Export Cable and AC Connection Cable corridor and temporary construction and permanent operational effects associated with LSS Blue and LSS Green would occur in geographically separate locations. The effects on the setting of heritage assets would also be localised and limited in extent, and no notable interactions between construction and operational effects are expected to give rise to additional significant effects. Consequently, no project lifetime effects greater than those identified for any individual phase are anticipated.	No change resulting from inter-related effects
Receptor-led effects					
For archaeological remains, the primary impact pathway is direct ground disturbance associated with land preparation, excavation and earthworks. While these activities may also generate noise, dust and traffic movements, these additional effects do not materially alter the significance of the archaeological receptor beyond the direct physical impacts already assessed within the Volume 3, Chapter 4: Onshore Archaeology and Cultural Heritage, of the PEIR. For heritage assets affected through changes within their setting, there is potential for visual effects identified within the Landscape and Visual Impact Assessment to occur concurrently with temporary increases in noise emissions and traffic movements during construction. The combination of these effects may influence how heritage assets are experienced; however, the cultural heritage assessment already considers the contribution of setting to the significance of heritage assets, and mitigation measures (CoT17, CoT18, CoT26, CoT27, CoT43) proposed within the relevant topic chapters would minimise these effects. Overall, it is unlikely that heritage assets would experience increased significance of inter-related effects beyond those already reported in Volume 3, Chapter 4: Onshore Archaeology and Cultural Heritage, of the PEIR, Volume 3, Chapter 1: Landscape and Visual Impact Assessment, of the PEIR, Volume 3, Chapter 8: Onshore Noise and Vibration, of the PEIR, and Volume 3, Chapter 7: Traffic and Transport, of the PEIR. Across the project lifetime, the effects on heritage assets 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 PEIR. Therefore, there is no change resulting from the inter-related effects.					

Table 5.20: Traffic and Transport - summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Impact of increases in traffic flows or changes in traffic composition and increases in Abnormal Indivisible Load (AIL) movements on the key road links, Strategic Road Network (SRN) and other	✓	✗	✓	Potential project lifetime inter-related effects may arise from increased traffic flows, changes in traffic composition and abnormal indivisible load movements during construction and decommissioning. The construction and decommissioning phases would not occur concurrently. Also, it is considered that the effects of the MHPGC project during the	No change resulting from inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
transport receptors (e.g., PRow) and sensitive users (e.g., driver and pedestrians) as a result of construction and decommissioning traffic associated with the MHPGC Project.				decommissioning phase will be no worse than during the construction period. There is no operational Traffic and Transport effect identified that would create a continuous pathway between these phases. As the effects during construction and decommissioning would be separated temporally, they are not anticipated to combine or accumulate to create an effect of greater significance than the effect reported for an individual phase. Therefore, no significant project lifetime inter-related effects are anticipated.	
Receptor-led effects					
There is potential for receptor-led effects associated with changes in traffic flows, road user experience and accessibility, together with impacts arising from Onshore Noise and Vibration, Onshore Air Quality and Human Health. These effects are assessed within Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 3, Chapter 7: Onshore Air Quality, of the PEIR, Volume 4, Chapter 2: Human Health, of the PEIR and Volume 4, Chapter 1: Landscape and Visual Impact Assessment, of the PEIR Construction traffic associated with the MHPGC Project may result in temporary increases in traffic movements, driver delay, non-motorised user delay, severance and changes in amenity. The same receptors may also experience temporary construction noise and vibration, visual disturbance associated with construction activities and changes in local environmental quality. Residential and non-residential receptors may experience associated effects through reduced accessibility, changes in active travel opportunities and community severance. However, the Traffic and Transport assessment identifies residual effects ranging from negligible to minor adverse and not significant. Construction road traffic noise effects are assessed as negligible to minor adverse and not significant, while Onshore Air Quality effects are assessed as not significant. Human Health effects associated with transport, access and connections are assessed as minor adverse and not significant. Although these effects may occur concurrently, they are not anticipated to interact in a manner that would increase the significance of effect beyond that already reported within the individual assessments. For the receptor-led effects, overall, it is unlikely that Traffic and Transport receptors would experience increased significance of inter-related effects beyond that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from the inter-related effects.					

Table 5.21: Onshore Noise and Vibration- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Noise impact from construction, operation and decommissioning activities (including Landfall, onshore export cables, Alternating Current (AC) connection cables and LSS)	✓	✓	✓	Noise impacts from construction and decommissioning activities (including the Landfall, onshore export cables and AC connection cables) are assessed as resulting in effects ranging from negligible to minor adverse. Construction and decommissioning effects would be temporary and would cease following completion of the respective works.	No change resulting from inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
				Noise impacts arising from construction, operation and maintenance, and decommissioning activities associated with the LSS have the potential to affect the same noise-sensitive receptors over the lifetime of the MHPGC Project. Construction noise effects at the LSS are assessed as ranging from negligible to minor adverse and not significant, whilst operational noise effects are yet to be confirmed at ES stage. Decommissioning noise effects are anticipated to be similar to, or lower than, those assessed for construction activities. Although receptors may experience noise effects during multiple phases of the Project, the effects would occur at different times and are not expected to interact in a manner that would increase the significance of effect beyond that identified within the individual phase adverse assessments.	
Vibration impact from construction, and decommissioning activities (including Landfall, onshore export cables, AC connection cables and LSS)	✓	✗	✓	Vibration impacts are anticipated during the construction phase for the Landfall, onshore export cables, AC connection cables and LSS, and during the decommissioning phase for the LSS. Therefore, the LSS represents the only component with the potential to experience vibration effects across multiple project phases. However, decommissioning vibration effects at the LSS are considered likely to be no worse than those experienced during construction. As construction effects would cease prior to decommissioning and the effects do not overlap temporally, there is no potential for project lifetime effects.	No change resulting from inter-related effects
Noise impact associated with additional vehicle movements on the local highway network	✓	✗	✓	Construction and decommissioning road traffic noise effects are assessed as negligible and not significant. Construction effects would cease prior to the operational phase and do not overlap temporally with decommissioning activities. Therefore, there is no potential for project lifetime effects.	No change resulting from inter-related effects
Receptor-led effects					
There is also potential for receptor-led effects where increased traffic movements, air-quality effects, visual change and associated human-health effects overlap spatially and temporally with the noise and vibration sensitive receptors identified in Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR. Volume 4, Chapter 1: LVIA, of the PEIR identifies Significant effects during the construction phase at 5 Viewpoints (VP2, VP6, VP9, VP10). Residential receptors in the location of the view points (R21, R17 and R03) may experience concurrent construction noise and/or vibration significant effects alongside changes in views (VP9, VP10 and VP14) associated with construction activities. While significant visual effects and significant noise effects have been identified separately within the relevant assessment chapters, the interaction of these effects would not materially increase the overall level of effect beyond that already assessed. However, the Volume 3, Chapter 5: Traffic and Transport, of the PEIR identifies residual effects that are predominantly negligible to minor and not significant, whilst the Human Health effects associated with noise and vibration shows Minor Adverse and not significant as identified in Volume 4, Chapter 2: Human Health, of the PEIR. Consequently, whilst these effects may occur spatially and temporally on the same receptors (residential, non-residential and transport receptors), they are not anticipated to interact in a manner that would increase the significance of effect beyond that already reported within the individual assessments. There is potential for receptor-led effects associated with construction and decommissioning noise and vibration effects and air quality effects acting on the same sensitive receptors. However, air quality effects are assessed as not significant and the majority of noise and vibration effects are assessed as negligible to minor adverse. Therefore, it is unlikely that receptors					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
would experience increased significance of effects beyond those already identified within Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR and Volume 3, Chapter 7: Onshore Air Quality, of the PEIR .					
For the receptor led effects, overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from the inter-related effects.					

Table 5.22: Onshore Air Quality- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Emissions of dust and air pollutants from construction and decommissioning activities	✓	✗	✓	Potential project lifetime inter-related effects may arise from dust and pollutant emissions generated during construction and decommissioning. Construction and decommissioning effects would occur in separate phases and would not act simultaneously. All assessed construction and decommissioning air-quality effects are reported as not significant. Subject to the application of the identified dust mitigation measures during both phases, the effects are not anticipated to accumulate or interact across the project lifetime to produce an effect of greater significance.	No change resulting from inter-related effects
Receptor-led effects					
There is potential for receptor-led effects associated with dust emissions and air pollutant emissions arising from construction and decommissioning activities, which are assessed within Volume 3, Chapter 7: Onshore Air Quality, of the PEIR. There is also potential for receptor-led effects associated with traffic movements, noise and vibration, human health, and habitats and ecological features, which are assessed within Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 4, Chapter 2: Human Health, of the PEIR and Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR. Sensitive human receptors (residential, non-residential and transport receptors) may experience dust and air pollutant emissions concurrently with increased traffic movements, construction noise and vibration, and temporary changes in accessibility and amenity. The risk of dust deposition resulting from construction or decommissioning activities would be controlled via the implementation of embedded mitigation)(CoT16, CoT18, CoT21) see Volume 3, Chapter 7: Onshore Air Quality, of the PEIR). However, the Onshore Air Quality assessment concludes that residual effects associated with dust emissions, construction traffic emissions and decommissioning traffic emissions are not significant. In addition, the associated effects identified within the Traffic and Transport, Human Health and Onshore Noise and Vibration assessments are predominantly negligible to minor adverse and not significant. Although these effects may occur spatially and temporally at the same receptors, they are not anticipated to interact in a manner that would increase the significance of effect beyond that already reported within the individual assessments.					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
For the receptor-led effects, overall, it is unlikely that sensitive human receptors (residential, non-residential and transport receptors) or ecological receptors would experience increased significance of inter-related effects beyond that already reported within the individual topic chapters. Therefore, there is no change resulting from the inter-related effects assessment.					

Table 5.23: Land Use Tourism and Recreation- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Temporary change to land use and/or land cover (working corridor/temporary compounds) temporarily restricting access to/use of land) used for public access, public open space, or other community activity, tourism and/or recreation related land use function and access to/use of land for agriculture, forestry or commercial activity.	✓	✗	✓	During construction and decommissioning, temporary restrictions to land, public access routes, community assets, tourism receptors, businesses and agricultural land holdings may occur due to working corridors, temporary compounds and construction activities. The construction and decommissioning phases would result in similar temporary effects on the same receptor groups. However, these phases would occur at different times and would not overlap temporally. As a result, receptors would not experience the construction and decommissioning effects simultaneously and there is no potential for the combined effects to result in a greater significance than the effects identified for each phase individually.	No change resulting from inter-related effects
Permanent change to land use due to presence of permanent features (e.g. LSS, transition joint bay, onshore export cable and AC connection cable).	✗	✓	✗	Permanent changes to land use are limited to the O&M phase. As no construction or operational effects are identified, there is no potential for interactions between project phases to give rise to project lifetime effects greater than those assessed within the decommissioning phase.	No change resulting from inter-related effects
Permanent limitations to land use due to wayleave and easement conditions along onshore cable route.	✗	✓	✗	Permanent limitations to land use are limited to the O&M phase, As no construction or operational effects are identified, there is no potential for interactions between project phases to give rise to project lifetime effects.	No change resulting from inter-related effects
Receptor-led effects					
Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR inherently considers receptor-led effects from other technical topic assessments, including Volume 4, Chapter 1: Landscape and Visual Impact Assessment, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 3, Chapter 5: Traffic and Transport, of the PEIR and Volume 3, Chapter 7: Onshore Air Quality, of the PEIR.					

Table 5.24: Agriculture and Soils- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Permanent loss of soil resources and Best and Most Versatile (BMV) agricultural land	✓	✗	✗	Construction activities associated with buildings, infrastructure and hardstanding areas would result in the permanent loss of soil resources and BMV agricultural land. These effects are confined to the construction phase, with the permanent change occurring at the point of land take and soil sealing. Therefore, there would be no change over the three phases.	No change resulting from inter-related effects.
Soil disturbance, handling and agricultural land drainage	✓	✗	✓	Potential impacts associated with soil compaction, soil erosion, degradation of topsoil and damage to agricultural drainage systems may occur during both the construction and decommissioning phases. However, these activities would be geographically and temporally separate and are assessed as slight adverse and not significant following implementation of embedded mitigation. As the effects are temporary, localised and recoverable, there is no potential for project lifetime effects to occur.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects associated with the permanent loss of soil resources and BMV agricultural land, soil compaction, soil erosion, degradation of soil quality and damage to agricultural drainage systems. These effects are assessed within the Volume 3, Chapter 9: Agriculture and Soils, of the PEIR and may interact with effects assessed within other topic chapters, including Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR, Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology of the PEIR, Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR and Volume 4, Chapter 3: Socio-economic, of the PEIR. Potential receptor-led effects may arise where soil disturbance, compaction and damage to agricultural drainage systems combine with changes to surface water runoff, flood risk and water resource availability. There is also potential for interactions between the permanent loss of agricultural land and habitat management identified within the ecology assessments. Construction traffic and plant movements may contribute to soil compaction and disturbance, whilst changes in agricultural land quality may indirectly affect farming activities and associated non-residential receptors. However, the majority of residual effects identified for agricultural land and soils are assessed as slight adverse (not significant), with the exception of the permanent loss of soil resources and BMV agricultural land which is assessed as moderate and potentially significant in isolation. The interaction of these effects is not anticipated to increase the significance beyond that already identified within the individual topic assessments. Therefore, it is unlikely that soil receptors would experience increased significance of inter-related effects beyond those already reported in the standalone chapters.					

Table 5.25: Landscape and Visual Amenity- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Changes to landscape elements, landscape character, landscape designations and visual amenity arising from construction, operation and decommissioning activities	✓	✓	✓	Potential effects on landscape character and visual receptors may occur during the construction, operation and decommissioning phases of the Project. Construction activities associated with the landfall, onshore export cable corridor, AC Connection cable corridor and LSS may result in temporary changes to landscape character and views. Operational effects are associated primarily with the presence of the LSS, while decommissioning effects would be temporary and similar in nature to those experienced during construction. Although there is potential for a lengthening of the temporal effect across the Project lifetime, the construction and decommissioning effects would be temporary and geographically limited, while operational effects are associated with a reduced development footprint following reinstatement of temporary works areas. The effects identified for landscape character areas, landscape designations and visual receptors are therefore not anticipated to interact in such a way as to result in combined effects of greater significance than those assessed within each individual phase. For visual receptors, the highest effects are associated with specific viewpoints and landscape character areas in close proximity to the MHPGC Project. However, these effects are already captured within the individual phase assessments and are not anticipated to increase in significance when considered across the MHPGC Project lifetime.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects associated with changes to landscape character and visual amenity arising from the interaction of landscape and visual effects with Historic Environment, Traffic and Transport, Onshore Ecology, Onshore Noise and Vibration, and Human Health. These effects are assessed within the relevant topic chapters Volume 3, Chapter 4: Onshore Archaeology and Cultural Heritage, of the PEIR, Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 4, Chapter 2: Human Health, of the PEIR and Volume 3, Chapter 3: Terrestrial Ecology and Terrestrial and Intertidal Ornithology, of the PEIR. As Volume 4, Chapter 1: LVIA, of the PEIR identifies Significant visual effects during the construction phase at 5 Viewpoints (VP2, VP6, VP9, VP10) and at 3 Viewpoints (VP6, VP9 and VP14) during the O&M phase, there is the potential for inter-related effects, however only the significant effects during construction for noise and vibration have been identified and as per Table 5.21, these are not expected to interact to cause an increase in significance overall. Potential receptor-led effects may also arise for recreational users, including users of PRow and open spaces, where changes to visual amenity occur alongside temporary access restrictions and construction disturbance. These effects are considered within the Volume 4, Chapter 2: Human Health, of the PEIR. Overall, it is unlikely that landscape and visual receptors would experience increased significance of inter-related effects beyond those already identified within the individual topic assessments. Therefore, there is no change resulting from the inter-related effects.					

Table 5.26: Human Health- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					
Air Quality and Dust (Onshore)	✓	✗	✓	Minor Adverse effects are identified for the construction and decommissioning phases, but these would be temporally separate for each of the phases. Therefore, it is considered that there is no potential for project lifetime effects to occur via this impact pathway.	No change resulting from inter-related effects.
Noise and Vibration (Onshore)	✓	✓	✓	Potential effects on human health receptors may arise during the construction and decommissioning phases as a result of temporary increases in noise and vibration from construction plant, equipment, vehicle movements and other site activities. During the operational and maintenance phase, potential effects on human health associated with noise and vibration arise from the noise related effects of the LSS. As construction and decommissioning effects would be temporary and would not overlap temporally with operational effects, the potential for project lifetime effects would depend on the significance of operational noise effects. The assessment of operational noise effects has not yet been completed and will be confirmed at the next stage of the assessment when further operational noise information becomes available. Therefore, it is not currently possible to determine whether project lifetime effects may arise via this impact pathway.	Will be confirmed at the ES stage when further operational noise information is available
Open space, leisure and play (Onshore)	✓	✓	✓	Temporary disruption to recreational users and open space receptors may occur during construction and decommissioning, while operational effects may be associated with the presence of permanent infrastructure. As these effects occur at different stages of the Project and are already assessed within the individual phases, there is no potential for project lifetime effects to occur that are greater than those identified within each phase assessment.	No change resulting from inter-related effects.
Land quality (Onshore)	✓	✗	✓	Temporary effects associated with land quality may occur during construction and decommissioning through ground disturbance, handling of soils and construction activities. No operational effects are anticipated. As the effects are temporary, localised and occur within separate project phases, there is no potential for project lifetime effects to occur.	No change resulting from inter-related effects.
Water quality (Onshore)	✗	✗	✓	Potential effects on water quality relevant to human health are limited to the decommissioning phase. As no construction or operational effects are identified, there is no potential for interactions between project phases to give rise to project lifetime effects.	No change resulting from inter-related effects.

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Electromagnetic fields (EMF) perception (Onshore)	X	✓	X	Effects associated with public perception of EMFs are limited to the operational phase. As no construction or decommissioning effects are identified, there is no potential for project lifetime effects to occur.	No change resulting from inter-related effects.
Transport modes, access and connections (Onshore)	✓	X	X	Temporary effects on transport modes, access and connections may occur during construction activities. No operational or decommissioning effects are identified. Therefore, there is no potential for interactions between project phases to result in project lifetime effects.	No change resulting from inter-related effects.
Employment and Income (Onshore)	✓	X	✓	Beneficial effects associated with employment and income may arise during construction and decommissioning through job creation, expenditure and support for local businesses. No operational effects are anticipated. Construction and decommissioning effects occur at separate points in time and are not expected to combine to create effects greater than those assessed within the individual phases.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects associated with impacts on residential, non-residential and transport receptors arising from changes in air quality, noise and vibration, open space and recreation, transport and access, water quality, land quality, and employment and income. These effects are assessed within Volume 4, Chapter 2: Human Health, of the PEIR and are informed by the findings of Volume 3, Chapter 7: Onshore Air Quality, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR, Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 2: Water Resources and Flood Risk, of the PEIR, Volume 3, Chapter 1: Geology, Hydrogeology and Ground Conditions, and Volume 4, Chapter 3: Socio-economics, of the PEIR. Temporary changes in air quality, noise levels, access to recreational resources and active travel routes, together with temporary disruption associated with construction activities, may act concurrently on local communities and sensitive receptors. There is also potential for receptor-led effects associated with changes to water quality and flood risk, where accidental spillages, contaminated runoff, sediment mobilisation or temporary alterations to drainage patterns could affect receptors reliant on surface water resources and recreational water environments. In addition, there is potential for receptor-led effects associated with land quality where ground disturbance, excavation activities, disturbance of contaminated land and changes to groundwater pathways may occur alongside other environmental effects acting on local communities and sensitive receptors. However, the contributing assessments identify predominantly minor adverse and not significant residual effects, whilst the employment and income assessment identifies potential beneficial effects. Consequently, it is unlikely that residential, non-residential and transport receptors would experience increased significance of effects beyond those identified within the individual assessments. Therefore, no change resulting from the inter-related effects is anticipated.					

Table 5.27: Socio-Economics- summary of likely significant inter-related effects

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Project lifetime effects					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Increased employment and Gross Value Added (GVA)	✓	✓	✓	Beneficial effects associated with employment generation and increases in GVA are anticipated during the construction, operation and decommissioning phases. Employment and GVA effects will occur within different locations and sectors of the economy, and at different times and intensities. As beneficial economic effects are anticipated across multiple phases of the MHPGC Project, there is potential for a prolonged beneficial influence on socio-economic receptors over the MHPGC Project lifetime. However, the nature and significance of these effects have been assessed within the individual phase assessments and are not anticipated to interact in a manner that would result in effects of greater significance than those already identified.	No change resulting from inter-related effects.
Economic impacts on the tourism economy from changes in visitor behaviour	✓	✓	✓	Impacts on visitor behaviour may occur during construction, operation and maintenance and decommissioning phases, as a result of changes to local amenity, views, noise, access arrangements, construction activity, and the presence of infrastructure. While effects may occur throughout multiple phases of the Project, the construction and decommissioning effects are temporary in nature, and operational effects have been assessed separately. The interaction of effects across the MHPGC Project lifetime is not anticipated to result in effects of greater significance than those identified within the individual phase assessments. Therefore, there is no potential for project lifetime effects greater than those assessed within any individual phase.	No change resulting from inter-related effects.
Economic impacts from changes to commercial fisheries	✓	✓	✓	Impacts on commercial fisheries may occur during the construction, operation and maintenance and decommissioning phases. Assessment of these impacts during the operation and maintenance phase is provided in the assessment conclusions in Volume 2, Chapter 7: Commercial Fisheries, of the PEIR. Socio-economic assessment of the impacts during the construction and decommissioning phases will be require further analysis following the outcome of consultation and engagement and will be presented in the ES, with consideration of the potential for project lifetime effects to occur.	No change resulting from inter-related effects.
Receptor-led effects					
There is potential for receptor-led effects associated with local residents, businesses, workers and visitors through interactions between socio-economic effects and effects assessed within the Volume 3, Chapter 5: Traffic and Transport, of the PEIR, Volume 3, Chapter 6: Onshore Noise and Vibration, of the PEIR, Volume 4, Chapter 2: Human Health, of the PEIR, Volume 4, Chapter 1: Landscape and Visual Amenity, of the PEIR and Volume 3, Chapter 8: Land Use, Tourism and Recreation, of the PEIR.					

Impact	Phase			Likely significant inter-related effects	Inter-related
	C	O	D		
Construction traffic may temporarily increase journey times, affect access to businesses, or cause disruption to local roads used by residents and visitors. Residents may experience temporary effects on wellbeing associated with construction activity, while also benefiting from employment opportunities generated by the MHPGC Project. Recreational users may experience temporary disruption to paths or open spaces, which could affect visitor experience and local recreational activities. Residents, visitors and recreational users may experience temporary changes in views and landscape character during construction. Nearby residents, workers and visitors may experience temporary construction noise and vibration. However, the interaction of these effects is not anticipated to increase the significance of effects on residential and non-residential receptors beyond those identified within the individual topic assessments. Therefore, there is no change resulting from the inter-related effects.					

5.6 Conclusion

- 5.6.1.1 The tables presented within this chapter provide the assessment of potential inter-related effects (both project lifetime and receptor-led effects) arising from the MHPGC Project on a range of sensitive receptor groups identified in **Paragraph 5.4.3.4**.
- 5.6.1.2 Following the implementation of mitigation measures adopted as part of the project and any additional mitigation identified through the ongoing EIA process and detailed design, project lifetime effects arising during the construction, O&M, and decommissioning phases of the MHPGC Project are unlikely to result in effects of greater significance than those reported individually in the PEIR.
- 5.6.1.3 Potential inter-related effects for both project lifetime and receptor led will be reviewed for the ES following project refinements for the application for development consent.

5.7 References

- Arrigo, K.R., van Dijken, G.L., Cameron, M.A., van der Grient, J., Wedding, L.M., Hazen, L., Leape, J., Leonard, G., Merkl, A., Micheli, F., Mills, M.M., Monismith, S., Ouellette, N.T., Zivian, A., Levi, M. and Bailey, R.M. (2020). Synergistic interactions among growing stressors increase risk to an Arctic ecosystem. *Nature Communications*, 11 (6255) Available at: <https://doi.org/10.1038/s41467-020-19899-z> (Accessed: September 2026).
- Benhemma-Le-Gall, A., Graham, I.M., Merchant, N.D. and Thompson, P.M. (2021). Broad-Scale Responses of Harbor Porpoises to Pile-Driving and Vessel Activities During Offshore Windfarm Construction. *Frontiers in Marine Science*, 8:664724. Available at: <https://doi.org/10.3389/fmars.2021.664724> (Accessed: August 2026).
- Benhemma-Le Gall, A., Thompson, P., Merchant, N. and Graham, I. (2023), Vessel noise prior to pile driving at offshore windfarm sites deters harbour porpoises from potential injury zones. *Environmental Impact Assessment Review*, 103: 107271. Available at: <https://doi.org/10.1016/j.eiar.2023.107271> (Accessed: August 2026).
- Buckstaff, K.C. (2004). Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 20 (4), pp.709-725.
- Department of Energy and Climate Change. (2025a). Overarching National Policy Statements for Energy (NPS EN-1). Available at: [Overarching National Policy Statement for energy \(EN-1\), 2025 \(accessible webpage\) - GOV.UK](#) (Accessed: July 2025).
- Department of Energy and Climate Change. (2025b). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: [National Policy Statement for renewable energy infrastructure \(EN-3\), 2025 - GOV.UK](#) (Accessed: July 2025).
- Department of Energy and Climate Change. (2025c). National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) Available at: [National Policy Statement for electricity networks infrastructure \(EN-5\), 2025 - GOV.UK](#) (Accessed: July 2025).
- Department for Levelling Up, Housing and Communities. (2025). National Planning Policy Framework. Available at: https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf (Accessed: July 2025).
- Department for Environment, Food and Rural Affairs. (2020). Marine Policy Statement. Available at: <https://assets.publishing.service.gov.uk/media/5a795700ed915d042206795b/pb3654-marine-policy-statement-110316.pdf> (Accessed: July 2025).
- Durham County Council. (2020). County Durham Plan. Available at: <https://www.durham.gov.uk/media/34069/County-Durham-Plan-adopted-2020-/pdf/CountyDurhamPlanAdopted2020vDec2020.pdf> (Accessed: July 2025).
- Graham, I.M., Merchant, N.D., Farcas, A., Barton, T.R., Cheney, B., Bono, S., and Thompson, P.M. (2019). Harbour porpoise responses to pile-driving diminish over time. *Royal Society Open Science*, 6 (6): 190335. Available at: <https://doi.org/10.1098/rsos.190335> (Accessed: September 2026).

Hague, E.L., Sparling, C.E., Morris, C., Vaughan, D., Walker, R., Culloch, R.M., Lyndon, A.R., Fernandes, T.F. and McWhinnie, L.H. (2022). Same Space, Different Standards: A Review of Cumulative Effects Assessment Practice for Marine Mammals. *Frontiers in Marine Science*, 9, 822467. Available at: <https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2022.822467/full> (Accessed: September 2026). Marine Directorate. (2015). Scotland's National Marine Plan. Available at: <https://www.gov.scot/publications/scotlands-national-marine-plan/> (Accessed: July 2025).

Marine Directorate – Licencing Operations Team. (2025). Scoping Opinion - Morven Offshore Wind Farm, Hawthorn Pit Grid Connection. Available at: https://marine.gov.scot/sites/default/files/morven_offshore_wind_farm_-_scop-0058_-_hawthorn_pit_grid_connection_-_scoping_opinion.pdf (Accessed: July 2025).

Marine Management Organisation. (2024). Northeast Marine Plans. Available at: <https://www.gov.uk/government/collections/north-east-marine-plan> (Accessed: July 2025).

Marine Management Organisation. (2025). Scoping request under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 for the proposed Morven Offshore Windfarm Transmission Assets Project by Morven Offshore Wind Limited. MMO Reference: DCO/2025/00005.

Nowacek, S.M., Wells, R.S. and Solow, A.R. (2001). Short-term effects of boat traffic on bottlenose dolphins *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 17 (4), pp.673-688.

RPS. (2025). Morven Hawthorn Pit Grid Connection Project Environmental Impact Assessment Scoping Report. Available at: <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0210005-000004-Morven%20Hawthorn%20Pit%20Grid%20Connection%20Project%20Scoping%20Report.pdf> (Accessed: July 2025).

Southall, B.L., Nowacek, D.P., Bowles, A.E., Senigaglia, V., Bejder, L., and Tyack, P.L. (2021). Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioural Responses to Human Noise. *Aquatic Mammals*, 47(5), 421-464. Available at: <https://www.aquaticmammalsjournal.org/wp-content/uploads/2021/09/47.5-AM-Southall.pdf> (Accessed: August 2026).

Teilmann, J., Tougaard, J. and Carstensen, J. (2006). Summary on Harbour Porpoise Monitoring 1999-2006 around Nysted and Horns Rev Offshore Wind Farms. Report by ENERGI E2. Report for Danish Ministry of the Environment. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Summary_on_Harbour_Porpoise_Monitoring_1999-2006.pdf (Accessed: September 2026).

The Institute of Environmental Management and Assessment. (2015). Environmental Impact Assessment. Guide to Delivering Quality Development.

The Planning Inspectorate. (2025). Scoping Opinion: Proposed Morven Hawthorn Pit Grid Connection Project - EN0210005. Available at: <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0210005-000005-Scoping%20Opinion%20-%20Morven%20Hawthorn%20Pit%20Grid%20Connection%20Project.pdf> (Accessed: July 2025).

Tougaard, J., Carstensen, J., Damsgaard Henriksen, O. and Teilmann, J. (2003). Short-term effects of the construction of wind turbines on harbour porpoises at Horns Reef: Report request. Commissioned by Techwise A/S. Hedeselskabet, Roskilde.

UK Government (2025). Marine environment: unexploded ordnance clearance Joint Position Statement. Available at: <https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-position-statement/marine-environment-unexploded-ordnance-clearance-joint-position-statement> (Accessed: August 2026).