

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 2, chapter 15: Inter-related effects (offshore)



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FINAL

Image of an offshore wind farm

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Contents

15 INTER-RELATED EFFECTS (OFFSHORE)1

15.1 Introduction.....1

 15.1.1 Overview1

 15.1.2 Purpose of chapter1

 15.1.3 Study area.....1

15.2 Policy context1

 15.2.1 National Policy Statements1

15.3 Consultation2

15.4 Data sources2

15.5 Impact assessment methodology.....2

 15.5.1 Guidance.....2

 15.5.2 Approach to assessment2

15.6 Assessment of inter-related effects.....4

 15.6.1 Physical environment.....4

 15.6.2 Biological environment.....6

 15.6.3 Human environment18

15.7 Summary32

15.8 Conclusion.....32

15.9 References32

Tables

Table 15.1: Summary of the NPS EN-1 provisions relevant to inter-related effects (offshore).1

Table 15.2: Summary of key consultation issues raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to inter-related effects (offshore).....2

Table 15.3: Summary of staged approach to the inter-related effects assessment for the Mona Offshore Wind Project.....2

Table 15.4: Topics not included in the Mona Offshore Wind Project inter-related effects assessment3

Table 15.5: Definitions of project lifetime and receptor-led inter-related effects.....3

Table 15.6: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – physical processes.....5

Table 15.7: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – benthic ecology.7

Table 15.8: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – fish and shellfish ecology.10

Table 15.9: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – marine mammals.....13

Table 15.10: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operational and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – offshore ornithology.....16

Table 15.11: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – commercial fisheries..... 19

Table 15.12: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – shipping and navigation..... 22

Table 15.13: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – aviation and radar..... 24

Table 15.14: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – marine archaeology.26

Table 15.15: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – other sea users..... 28

Table 15.16: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – seascape, landscape and visual resources. 31

Glossary

Term	Meaning
Inter-related effects	Multiple effects upon the same receptor arising from the Mona Offshore Wind Project. These occur either where a single effect acts upon a receptor over time to produce a potential additive effect or where a number of separate effects, such as underwater sound and collision risk, affect a single receptor
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Mona Offshore Wind Project, (construction, operations and maintenance and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. underwater sound effects from construction piling, operational wind turbines, vessels and decommissioning)
Receptor-led effects	Assessment of the scope for multiple effects to interact to create inter-related effects on a receptor. As an example, multiple effects on a given receptor such as benthic habitats (e.g. direct habitat loss or disturbance, sediment plumes, scour, jack-up vessel use etc.) may interact to produce a different or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects

Acronyms

Acronym	Description
AEZ	Archaeological Exclusion Zone
ATC	Air Traffic Control
BEIS	Department for Business, Energy and Industrial Strategy
CMS	Collision Mitigation System
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
IEF	Important Ecological Feature
HMR	Helicopter Main Route
HVAC	High Voltage Alternating Current
INNS	Invasive and Non-native Species
INNSMP	Invasive and Non-native Species Management Plan
MHWS	Mean High Water Springs
NPS	National Policy Statement
NRW	Natural Resources Wales

Acronym	Description
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
REWS	Radar Early Warning Systems
SAC	Special Area of Conservation
SAR	Search and Rescue
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest
UXO	Unexploded Ordnance
ZOI	Zone of Influence

Units

Unit	Description
%	Percentage
km ²	Square kilometres

15 Inter-related effects (offshore)

15.1 Introduction

15.1.1 Overview

15.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the offshore inter-related effects associated with potential impacts of the Mona Offshore Wind Project on offshore inter-related effects. Specifically, this chapter considers the potential offshore impacts of the Mona Offshore Wind Project during the construction, operations and maintenance, and decommissioning phases. The onshore impacts of the Mona Offshore Wind Project are addressed in volume 3, chapter 25: Inter-related effects (onshore) of the PEIR.

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

- Volume 2, chapter 6: Physical processes of the PEIR
- Volume 2, chapter 7: Benthic subtidal and intertidal ecology of the PEIR
- Volume 2, chapter 8: Fish and shellfish ecology of the PEIR
- Volume 2, chapter 9: Marine mammals of the PEIR
- Volume 2, chapter 10: Offshore ornithology of the PEIR
- Volume 2, chapter 11: Commercial fisheries of the PEIR
- Volume 2, chapter 12: Shipping and navigation of the PEIR
- Volume 2, chapter 13: Marine archaeology of the PEIR
- Volume 2, chapter 14: Other sea users of the PEIR
- Volume 2, chapter 26: Seascape, landscape and visual resources of the PEIR
- Volume 2, chapter 27: Aviation and radar of the PEIR.

15.1.2 Purpose of chapter

15.1.2.1 The primary purpose of the PEIR is outlined in volume 1, chapter 1: Introduction of the PEIR. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for the Mona Offshore Wind Project under the Planning Act 2008 (the 2008 Act). The PEIR constitutes the Preliminary Environmental Information for the Mona Offshore Wind Project and sets out the findings of the Environmental Impact Assessment (EIA) to date to support the pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

15.1.2.2 The PEIR forms the basis for statutory consultation which will last for 47 days and conclude on 04 June 2023. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement,

which will be submitted in support of the application for Development Consent scheduled for quarter one of 2024.

15.1.2.3 In particular, this PEIR chapter presents:

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

15.1.3 Study area

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

15.2 Policy context

15.2.1 National Policy Statements

15.2.1.1 Planning policy on renewable energy infrastructure is presented in volume 1, chapter 2: Policy and legislative context of the PEIR. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to inter-related effects (offshore), is contained in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1; DECC, 2011a), the NPS for Renewable Energy Infrastructure (NPS EN-3; DECC, 2011b) and the NPS for Electricity Networks Infrastructure (NPS EN-5; DECC, 2011c).

15.2.1.2 NPS EN-1 includes guidance on what matters are to be considered in the assessment. This is summarised in Table 15.1 below.

15.2.1.3 Table 15.1 refers to the current NPSs, specifically NPS EN-1 (DECC, 2011a). If the NPSs are updated prior to the application for Development Consent, the revised NPSs will be fully considered in relation to inter-related effects (offshore) within the Environmental Statement.

Table 15.1: Summary of the NPS EN-1 provisions relevant to inter-related effects (offshore).

Summary of NPS EN-1 provision	How and where considered in the PEIR
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 4.2.6)	Project lifetime effects and receptor-led effects are assessed throughout this chapter of the PEIR.

15.3 Consultation

15.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to inter-related effects (offshore) is presented in Table 15.2 below, together with how these issues have been considered in the production of this PEIR chapter.

Table 15.2: Summary of key consultation issues raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to inter-related effects (offshore).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
May 2022	Natural Resources Wales (NRW) – Scoping Opinion	With reference to section 4.3.8 Potential cumulative effects, section 4.3.9 Potential inter-related effects and section 4.3.10 Potential transboundary impacts, as advised above, NRW (A) disagree with the scoping boundaries and therefore do not agree with the assessment search areas described.	This issue related to volume 2, chapter 9: Marine mammals of the PEIR and has been addressed within that chapter.

15.4 Data sources

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

15.5 Impact assessment methodology

15.5.1.0 The inter-related effects (offshore) impact assessment has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. The following definition of inter-related effects has been applied throughout this chapter:

- ‘Multiple effects upon the same receptor arising from the Mona Offshore Wind Project. These occur either where a single effect acts upon a receptor over time to produce a potential additive effect or where a number of separate effects, such as underwater noise and collision risk, affect a single receptor, for example marine mammals’.

15.5.1 Guidance

15.5.1.1 Specific to the inter-related effects (offshore) impact assessment, the Planning Inspectorate Advice Note 9 (Planning Inspectorate, 2018) has been considered, with specific regard to the following text (paragraph 4.13) *“ensure that interactions (interactions between aspect assessments includes where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna) between aspect (the Planning Inspectorate refers to ‘aspects’ as meaning the relevant descriptions of the environment identified in accordance with the EIA Regulations)*

assessments are taken into account relevant to the worst case scenario(s) established and that careful consideration is given to how these are assessed.”

15.5.1.2 The approach also serves to accommodate Planning Inspectorate Advice Note 9 regarding the need to consider the assessment as a whole and not as a series of unconnected specialist reports.

15.5.2 Approach to assessment

15.5.2.1 The approach to assessing inter-related effects within this chapter has followed a four stage process, as summarised in Table 15.3 and outlined below. Further details on the approach summarised above and used to develop this chapter are presented in volume 1, chapter 5: EIA methodology of the PEIR.

Table 15.3: Summary of staged approach to the inter-related effects assessment for the Mona Offshore Wind Project

Stage	Description
1	Assessment of effects undertaken for individual EIA topic areas within chapters 6 to 14, 25 and 26.
2	Review of assessments undertaken within chapters 6 to 14, 25 and 26 to identify ‘receptor groups’ requiring assessment.
3	Identification of potential inter-related (offshore) effects on receptor groups through review of the topic-specific assessments in the PEIR chapters.
4	Assessment undertaken on how individual effects may combine to create inter-related effects on each receptor group for: <ul style="list-style-type: none"> • ‘Project lifetime effects’ (i.e. during construction, operations and maintenance and decommissioning phases) • ‘Receptor-led effects’ (i.e. multiple effects on a single receptor).

Stage 1: Topic-specific assessments

15.5.2.2 The first stage of the assessment of inter-related (offshore) effects is presented in each of the individual offshore PEIR topic chapters and comprises the individual assessments of effects on receptors across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project.

Stage 2: Identification of receptor groups

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

- Physical environment:
 - Physical processes
- Biological environment:

- Benthic subtidal and intertidal ecology
- Fish and shellfish ecology
- Marine mammals
- Offshore ornithology
- Human environment:
 - Commercial fisheries
 - Shipping and navigation
 - Aviation and radar
 - Marine archaeology
 - Seascape, landscape and visual resources
 - Other sea users.

15.5.2.4 It is important to note that the significance of effects on different receptors in the same receptor group (i.e. different species of birds in 'offshore ornithology') may vary according to the sensitivity of receptors. Therefore, where a number of species have been considered within the assessments in this chapter, a range is provided for significance of effect.

15.5.2.5 For some other individual topic chapters, an assessment of potential inter-related effects is inherent within the chapter itself and as such, is not covered in this inter-related effect assessment. The topics where this applies are shown below in Table 15.4.

Table 15.4: Topics not included in the Mona Offshore Wind Project inter-related effects assessment

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

Topic	Definition
Marine Nature Conservation Sites*	The assessment of inter-related effects is central to the assessment of potential effects on the integrity of designated sites and has therefore already been assessed within the individual chapters of the PEIR, and within the Draft Information to Support the Appropriate Assessment. No additional levels of inter-related or receptor led effects are therefore considered to occur at the site level beyond those identified in the topic specific chapters of the PEIR and the Draft Information to Support the Appropriate Assessment.

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

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

Linked receptor groups

15.5.2.7 It is important to recognise potential linkages between the topic-specific chapters within this PEIR, whereby effects assessed in each chapter have the potential for secondary effects on any number of other receptors. Examples include:

- Volume 2, chapter 7: Benthic subtidal and intertidal ecology of the PEIR addresses effects on benthic habitats and species arising from changes to the physical environment (as described in chapter 6: Physical Processes)
- Volume 2, chapter 9: Marine Mammals of the PEIR assesses the effects on marine mammal receptors arising from potential changes in the distribution of fish, which form their principal prey (as described in volume 2, chapter 8: Fish and shellfish ecology of the PEIR)
- Volume 2, chapter 11: Commercial fisheries of the PEIR assesses the effects on commercial fisheries receptors arising from potential impacts on commercial species of fish and shellfish as a result of a combination of effects caused by electromagnetic fields (EMFs), suspended sediments, habitat alteration/loss and underwater noise impacts
- Volume 2, chapter 14: Other sea users of the PEIR assesses the effects on aggregate extraction areas arising from potential impacts on aggregate resource as a result of potential increase in suspended sediment concentrations (SSCs) and deposition and effects on sediment transport pathways (as described in volume 2, chapter 6: Physical processes of the PEIR).

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

15.5.2.9 It should be noted that it is not considered that there are likely to be any receptor led effects from combined onshore and offshore activities and as a result this has not been considered further in this offshore inter-related effects chapter or the onshore inter-related effects chapter (volume 3, chapter 24: Inter-related effects (onshore) of the PEIR).

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

15.5.2.10 Individual effects on each of the key receptors were identified across the three project phases (i.e. project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in Table 15.15. This information has been presented within the assessment tables in this chapter (see Table 15.6 to Table 15.16).

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

Effect type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Mona Offshore Wind Project, (construction, operations and maintenance and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. underwater noise effects from construction piling, operational wind turbines, vessels and decommissioning).

Effect type	Definition
Receptor-led effects	Assessment of the scope for multiple effects to interact to create inter-related effects on a receptor. As an example, multiple effects on a given receptor such as benthic habitats (e.g. direct habitat loss or disturbance, sediment plumes, scour, jack-up vessel use etc.) may interact to produce a different or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

15.5.2.11 The significance of the individual effects is presented in the summary of impacts, mitigation measures and monitoring tables for each receptor group within the topic-specific chapters (all conclusions for significance of effect for impacts defined in the topic chapters assume successful implementation of mitigation measures where appropriate (i.e. the residual effect has been used)). A descriptive assessment of the scope for these individual effects to interact to create a different or greater effect is then undertaken (see Table 15.6 to Table 15.16). This assessment incorporates qualitative and, where reasonably possible, quantitative assessments. The assignment of significance of effect to any such inter-related effect is not undertaken, rather, any inter-related effects that may be of greater significance than the individual effects acting in isolation on a given receptor are identified and discussed within this chapter.

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

15.6 Assessment of inter-related effects

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

15.6.1 Physical environment

Physical processes

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

- Increase in suspended sediments due to construction, operations and maintenance and/or decommissioning related activities, and the potential impact to physical features
 - Changes to tidal currents, wave climate, littoral currents and sediment transport.
- 15.6.1.2 Table 15.6 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for physical processes receptors.
- 15.6.1.3 As previously noted, effects on physical processes also have the potential to have secondary effects on other receptors and these effects are fully considered in the topic-specific chapters. These receptors and effects are:
- Benthic subtidal and intertidal ecology
 - Increased SSC
 - Sediment deposition
 - Fish and shellfish ecology
 - Increased SSC
 - Sediment deposition
 - Marine mammals
 - Changes to tidal current and wave climate
 - Increased SSC
 - Sediment deposition
 - Other sea users
 - Increased SSC
 - Changes to tidal current and wave climate.

Table 15.6: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – physical processes

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

Receptor-led effects

Menai Strait & Conwy Bay Special Area of Conservation (SAC), Constable Bank and Traeth Pensarn (Site of Special Scientific Interest (SSSI)): During principally the operations and maintenance phase increased SSCs and associated deposition on physical features may occur due to maintenance activities; this would coincide with changes to tidal currents, wave climate, littoral currents and sediment transport due to the presence of the structures. Maintenance activities are sporadic, with the impacts predicted to be of local spatial extent, short term duration and intermittent. These would not be significant in EIA terms.

15.6.2 Biological environment

Benthic subtidal and intertidal ecology

15.6.2.1 For benthic subtidal and intertidal ecology, the following potential impacts have been considered within the inter-related assessment:

- Temporary and long term habitat loss/disturbance
- Increased SSCs and associated sediment deposition
- Disturbance/remobilisation of sediment-bound contaminants
- Colonisation of hard substrate
- Increased risk of introduction and spread of invasive and non-native species
- Removal of hard substrate
- Alteration of seabed habitats arising from effects of physical processes
- EMFs from subsea electrical cabling.
- Heat from subsea electrical cabling

15.6.2.2 Table 15.7 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for benthic ecology receptors.

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

- Fish and shellfish ecology
 - Colonisation of hard substrates
- Commercial fisheries
 - Increased risk of introduction and spread of Invasive and Non-native Species (INNS).

Table 15.7: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – benthic ecology.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Temporary and long term habitat loss/disturbance.	✓	✓	✓	<p>The total area of habitat potentially affected, when disturbance and loss are considered additively across all phases, is greater than for each individual phase (e.g. just the construction phase). However, temporary habitat loss/disturbance arising during each phase of the Mona Offshore Wind Project will be highly localised to the vicinity of the activities being undertaken (i.e. limited to the immediate footprints) during each phase (i.e. construction, operations and maintenance and decommissioning). Individual activities (e.g. jack-up activities, cable burial etc.) resulting in temporary habitat loss/disturbance will occur intermittently throughout this time with only a small proportion of the total area of habitat being impacted at any one time. The predominantly mixed sediment habitats present within the Mona Array Area are typical of, and widespread throughout, the UK and in the east Irish Sea. All sediments and associated benthic communities are predicted to recover. Whilst there is the potential for repeat disturbance to occur during the operations and maintenance phase to habitats previously disturbed during the construction phase (e.g. as a result of jack-up activities and cable repair/reburial etc.) it is predicted that the benthic communities will have fully recovered from construction impacts by this time.</p> <p>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased SSCs and associated sediment deposition	✓	✓	✓	<p>Activities with the potential to result in the greatest level seabed disturbance and, therefore, highest increases in SSC/deposition, will occur during the construction phase. Any effects on benthic communities during this time will be intermittent, temporary and short term. The benthic subtidal IEFs potentially affected by increased SSC and deposition are predicted to have recovered in the intervening period between phases (i.e. prior to any localised increases in SSC during maintenance activities in the operations and maintenance phase).</p> <p>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Disturbance/remobilisation of sediment-bound contaminants	✓	✓	✓	<p>This impact is expected to occur in the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Farm during activities that disturb seabed sediments. However, additive effects across the lifetime of the Mona Offshore Wind Project are considered highly unlikely on the basis of the physical processes modelling outputs which have shown that increases in SSC (and therefore associated contaminants) will be temporary and will return to baseline within a few tidal cycles. This is not predicted to result in any significant combined impact across phases greater than what has been assessed for each individual phase. For example, remobilisation as a result of construction activities will only result in low concentrations of sediment-bound contaminants which as noted above will have been dispersed over a large area therefore they will not interact with potential contaminants released from operations and maintenance activities.</p> <p>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Colonisation of Hard Substrate	✓	✓	✗	<p>This impact will occur throughout the construction and operations and maintenance phases of the Mona Offshore Wind Project. The communities that develop on the introduced hard structures will likely differ from the surrounding sedimentary biotopes but may be typical of areas of coarse and stony substrate in the area and is likely to result in an increase in biodiversity. Also, the amount of the hard infrastructure is expected to be consistent between the construction and operations and maintenance phases, and this will provide long-term stability to any communities which form.</p> <p>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased risk of introduction and spread of invasive and non-native species	✓	✓	✓	<p>Although the presence and movement of construction/decommissioning vessels in the area may facilitate the introduction and spread of INNS across all phases of the Mona Offshore Wind Project, this effect will predominantly arise during the operations and maintenance phase. This is because, the presence of the hard substrate associated with the infrastructure will be present in the operations and maintenance phase which may provide INNS with the necessary substrate on which to settle. However, the measures adopted as part of the Mona Offshore Wind Project include the implementation of an Offshore Environmental Management Plan with provisions for management of invasive and non-native species. This will ensure that the risk of potential introduction and spread of INNS will be minimised across all phases.</p> <p>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Description of impact	Phase ^a Likely significant inter-related effects			Inter-related significance	
	C	O	D		
Removal of Hard Substrate	x	x	✓	Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Alteration of seabed habitats arising from effect of the Mona offshore wind project on physical processes	x	✓	x	Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Electromagnetic Fields (EMF) from subsea electrical cabling.	x	✓	x	Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Heat from subsea electrical cabling.	x	✓	x	Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment

Receptor-led effects

There is the potential for spatial and temporal interactions between the effects arising from habitat loss/disturbance/alteration and increased SSC and associated sediment deposition and resuspension of contaminants, EMF and heat on benthic habitats during the lifetime of the Mona Offshore Wind Project.

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

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

Across the project lifetime, the additive effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.

Fish and shellfish ecology

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

Table 15.8: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – fish and shellfish ecology.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Temporary and long term habitat loss/disturbance	✓	✓	✓	<p>When subtidal habitat loss (temporary and long term) is considered additively across all phases of the Mona Offshore Wind Project, although the total area of habitat affected is larger than for the individual project stages, similar habitats are widespread across the fish and shellfish ecology study area and the wider Irish Sea. During the operational and maintenance phase, most of the disturbance will be highly localised, and the habitats affected are predicted to recover quickly following completion of maintenance activities with fish and shellfish IEFs recovering into the affected areas. Also, many operations and maintenance activities will be located in the same areas affected during construction (e.g. jack up operations adjacent to wind turbines, or reburial of exposed cables). Decommissioning will also be impacting the same locations, to a lesser degree than during construction.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Underwater sound impacting fish and shellfish receptors	✓	✗	✗	<p>The impact of underwater sound from piling will only arise during the construction phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased suspended SSCs and associated sediment deposition	✓	✓	✓	<p>The majority of the seabed disturbance (resulting in highest SSC/deposition) will occur during the construction and decommissioning phases, with minor increases in SSC/deposition during the operations and maintenance phase. IEFs and associated spawning/nursery habitats potentially affected by increased SSC and deposition will recover quickly following impact exposure such that there will be no inter-related effects across the construction, operations and maintenance and decommissioning phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
EMFs from subsea electrical cabling	✗	✓	✗	<p>This effect will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased risk of introduction and spread of invasive and non-native species	✓	✓	✓	<p>Although the presence and movement of construction/decommissioning vessels in the area may facilitate the introduction and spread of INNS across all phases of the Mona Offshore Wind Project, this effect will predominantly arise during the operations and maintenance phase. This is because, the presence of the hard substrate associated with the infrastructure will be present in the operations and maintenance phase which may provide INNS with the necessary substrate on which to settle. However, the measures adopted as part of the Mona Offshore Wind Project include the implementation of an Offshore Environmental Management Plan with provisions for management of invasive and non-native species. This will ensure that the risk of potential introduction and spread of INNS will be minimised across all phases.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Colonisation of hard structures	✓	✓	✓	<p>This impact will occur throughout all phases of the Mona Offshore Wind Project development, with the expected development of hard substrate communities throughout the lifetime of the infrastructure. These communities will differ from the surrounding sedimentary biotopes but are unlikely to represent a significant decrease in biodiversity. Also, much of the hard infrastructure is expected to be left in place following decommissioning, and this will provide long-term stability to any communities which form.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Disturbance/remobilisation of sediment-bound contaminants	✓	✓	✓	<p>This impact is expected to occur in the construction, operations and maintenance and decommissioning phases. However, it is unlikely to have any additive effects due to the modelling and literature suggesting re-sedimentation to negligible volumes within a few tidal cycles, which will not cause any significant combined impact across phases greater than what has been assessed for each individual phase.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Injury due to increased risk of collision with vessels (basking shark only)	✓	✓	✓	<p>This impact is unlikely to have any additive effect across the three phases of the Mona Offshore Wind Project, due to the implementation of a Construction Management Plan that includes provisions for vessels and vessel transit corridors. Should any collisions occur, the impact will be limited to that phase of activity.</p> <p>Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Receptor-led effects

Potential exists for spatial and temporal interactions between habitat loss or disturbance, underwater noise, increased SSC/deposition, colonisation of hard substrates, EMF effects, disturbance and remobilisation of sediment-bound contaminants, and injury to basking shark from vessel collisions during the lifetime of the Mona Offshore Wind Project.

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

These individual impacts were assigned a significance of negligible to minor adverse as standalone impacts and although potential combined impacts may arise, it is important to recognise that some of the activities potentially resulting in combined effects are mutually exclusive. For example, most effects associated with an increase in SSC/deposition will arise from seabed preparation and sandwave clearance works installation of the Mona offshore export and inter-array cables, whereas most noise effects will arise from foundation piling undertaken at a different time. In addition, these impacts will be temporary and reversible following cessation of construction or decommissioning, with fish and shellfish communities expected to recover into the Mona Array Area. Furthermore, underwater sound from piling operations is predicted to result in the displacement of mobile fish from areas around foundations which in turn will mean that these species will not be exposed to the greatest predicted increases in SSC. Any potential behavioural effects as a result of EMF would be likely to occur over the same area as habitat loss/change effects (i.e. within metres of the cable) and therefore habitat loss effects would not be additive to EMF effects. There may be localised changes in fish and shellfish communities in the areas affected by long term habitat loss, due to potential changes in substrate type and foraging opportunities, and potential behavioural effects associated with EMF. Any shifts in baseline assemblage will be limited to these areas and, therefore, effects of greater significance than the individual impacts in isolation (i.e. negligible to moderate) are not predicted.

Overall, the evidence presented in volume 2, chapter 8: Fish and shellfish ecology of the PEIR, indicates that impacts on fish and shellfish receptors from construction operations (particularly piling) are temporary and reversible and that fish and shellfish communities are not significantly adversely affected by the presence of operational wind farms and therefore additive effects across impacts and phases are not expected to occur.

Across the project lifetime, the additive effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.

Marine mammals

- 15.6.2.7 For marine mammals, the following potential impacts have been considered within the inter-related assessment:
- Injury and disturbance from elevated underwater sound during piling
 - Injury and disturbance from elevated underwater sound during site investigation surveys
 - Injury and disturbance from elevated underwater sound during unexploded ordnance (UXO) clearance
 - Injury and disturbance from elevated underwater sound due to vessel use and other activities
 - Increased risk of injury due to collision with vessels
 - Underwater sound from wind turbine operation
 - Changes in fish and shellfish communities affecting prey availability.
- 15.6.2.8 Table 15.9 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for marine mammal receptors.
- 15.6.2.9 As previously noted, marine mammals and fish and shellfish ecology are linked receptor groups and the inter-related effects associated with a change in the distribution and/or abundance of prey species for marine mammals across each phase of the project has been fully assessed in volume 2, chapter 9: Marine mammals of the PEIR, with effects of minor adverse significance predicted for all project phases.

Table 15.9: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – marine mammals.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Injury and disturbance from elevated underwater sound during piling	✓	✗	✗	The impact of elevated underwater sound during piling will only arise during the construction phase and as such there will be no inter-related effects across the project phases of the Mona Offshore Wind Project. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound during site investigation surveys	✓	✗	✗	The impact of elevated underwater sound during site investigation surveys will only arise during the construction phase and as such there will be no inter-related effects across the project phases of the Mona Offshore Wind Project. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound during UXO clearance	✓	✗	✗	The impact of elevated underwater sound during UXO clearance will only arise during the construction phase and as such there will be no inter-related effects across the project phases of the Mona Offshore Wind Project. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Injury and disturbance to marine mammals from elevated underwater sound due to vessel use and other activities	✓	✓	✓	Vessels will be used throughout all stages of the Mona Offshore Wind Project and therefore the impact of injury and disturbance to marine mammals from elevated underwater sound due to vessel use throughout all stages could cause additional disturbance to marine mammals compared to considering each stage separately. For other activities, including drilling (foundation installation) and cable trenching/laying, the effect will only arise during the construction phase. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Increased risk of injury of marine mammals due to collision with vessels	✓	✓	✓	Over the lifetime of the Mona Offshore Wind Project there will be an ongoing risk of collision associated with vessel activity throughout all phases. If injury to marine mammals from collisions did occur this could lead to losses of individuals and potentially have an effect at the population-level, particularly for species with smaller populations, such as bottlenose dolphin and harbour seal. However, there is a high likelihood that marine mammals will avoid vessels, as they will be disturbed by underwater sound from the vessel, thereby reducing collision risk. In addition, with designed-in measures the risk of collisions will be further reduced through an Offshore Environmental Management Plan (EMP) with provisions for vessels and vessel movements, which includes provisions for vessels and vessel transit corridors to minimise the potential for collision risk. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Underwater sound from wind turbine operation	✗	✓	✗	The impact of underwater sound from wind turbine operation will only arise during the operations and maintenance phase and as such there will be no inter-related effects across the project phases of the Mona Offshore Wind Project. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Changes in fish and shellfish communities affecting prey availability	✓	✓	✓	Fish and shellfish communities may be impacted through all phases of the Mona Offshore Wind Project and therefore could present a long-term effect on marine mammals through changes to prey availability. Inter-related effects on fish and shellfish receptors are described in more detail in Table 15.8 and in volume 2, chapter 8: Fish and shellfish of the PEIR. For all potential impacts and at all phases of the Mona Offshore Wind Project the effects are, however, predicted to be very localised and unlikely to lead to significant effects on marine mammals. Even in the context of longer-term impacts there is unlikely to be an additive effect as marine mammals can exploit a suite of prey species and only a small area will be affected when compared to available foraging habitat in the east Irish Sea. Across the project lifetime, the effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment

Receptor-led effects

Description of impact	Phase ^a Likely significant inter-related effects C O D	Inter-related significance
<p>There is the potential for spatial and temporal interactions between the effects arising from elevated underwater sound (due to piling, UXO clearance, site investigation surveys, and vessel use and other (non-piling) activities), collision risk with vessels and changes in prey availability during the lifetime of the Mona Offshore Wind Project.</p> <p>Based on current understanding and expert knowledge, the greatest potential for inter-related effects is predicted to arise through the interaction of injury and disturbance from elevated underwater sound during piling, elevated underwater sound during UXO clearance, elevated underwater sound due to vessel use and other (non-piling) activities and elevated underwater sound during site investigation surveys, due to the Mona Offshore Wind Project.</p> <p>These impacts were assigned a significance of minor as individual impacts and although potential combined effects may arise (i.e. spatial and temporal overlap of noise impacts) it is not predicted that this will result in effects of greater significance than the individual impacts in isolation. Whilst individual impacts could add to the overall duration of elevated underwater sound spatially, the extent of noise disturbance will be restricted to the Mona Offshore Wind Project and the extent of the largest Zone of Influence (i.e. piling). As Permanent Threshold Shifts (PTS) are not predicted to occur in any marine mammal species, with the implementation of designed in measures, and Temporary Threshold Shift (TTS) is a recoverable impact, it is predicted that there would be no interrelated effect with respect to injury to marine mammal IEFs. With respect to disturbance, the potential for interrelated effects is considered to be minimal as individual animals are likely to be disturbed over a range dictated by the 'loudest' noise (i.e. leading to the greatest disturbance range) such that the potential for secondary (additive) effects from other activities that result in smaller ranges is reduced where animals are already disturbed over the largest effect range.</p> <p>Across the project lifetime, the additive effects on marine mammal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>		

Offshore ornithology

- 15.6.2.10 For offshore ornithology, the following potential impacts have been considered within the inter-related assessment:
- Disturbance and displacement from airborne noise, underwater sound, and presence of vessels and infrastructure
 - Indirect impacts from underwater sound affecting prey species
 - Temporary habitat loss/disturbance and increased SSCs
 - Collision risk
 - Barrier effects.
- 15.6.2.11 Table 15.10 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance phase, and decommissioning of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for offshore ornithology receptors.
- 15.6.2.12 As previously noted, ornithological receptors and fish and shellfish receptors are linked and the inter-related effects associated with a change to the prey resources of ornithological receptors has been fully assessed in chapter 10: Offshore ornithology of the PEIR, with effects of negligible significance predicted during construction, effects of negligible to minor adverse significance predicted during the operations and maintenance phase and effects of negligible to minor adverse significance during decommissioning.

Table 15.10: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operational and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – offshore ornithology.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Disturbance and displacement from airborne noise, underwater sound, and presence of vessels and infrastructure	✓	✓	✓	<p>The impact of disturbance and displacement caused by construction activities and associated vessel movements is predicted to be of negligible to minor significance depending on species, which is insignificant in EIA terms. The birds disturbed during the construction phase are expected to return as soon as the specific and locally active works are completed at the operations and maintenance phase. Although the shorter construction period has a displacement impact of lower magnitude than operation, it slightly extends the period over which displacement impacts may occur overall.</p> <p>During the operations and maintenance phase, the presence of operational wind turbines has the potential to directly disturb common guillemot, razorbill, Atlantic puffin, northern gannet, and black-legged kittiwake, leading to displacement from the Mona Array Area including an area of variable size or buffer (depending on species' sensitivity) around it. This effect was predicted to be of negligible to minor significance depending on species.</p> <p>Whilst the operations and maintenance phase will feature a much-reduced level of boat activity in comparison to the construction phase, the decommissioning phase will require similar number of vessels to the construction phase. The effects of decommissioning activities are expected to be similar magnitude to those arising from construction. Like the construction phase, the decommissioning phase has a displacement impact of lower magnitude than operation. Yet, it slightly extends the period over which displacement impacts may occur during the lifetime of the Mona Offshore Wind Project.</p> <p>Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Indirect impacts from underwater sound affecting prey species	✓	✗	✓	<p>Indirect impacts caused by a change in prey species (e.g., cod, sprat, herring, and sandeel) will occur during the construction and decommissioning phases. There will be no inter-related effects between construction and decommissioning which do not overlap.</p> <p>Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Temporary habitat loss/disturbance and increased suspended sediment concentrations (SSCs)	✓	✓	✓	<p>During construction and decommissioning, seabirds may be indirectly disturbed and displaced as a result of direct impacts on habitat and increased SSCs, which may result in the loss of a food resource to birds in the Mona Array Area and along the Mona Offshore Cable Corridor. This will lead to temporary habitat disturbance at a local scale.</p> <p>During the operations and maintenance phase, activities within Mona Array Area may lead to increases in SSCs and associated sediment deposition over the operational lifetime of the Mona Offshore Wind Project. The magnitude of the impacts would be a small fraction of those quantified for the construction and decommissioning phase. The prey species and habitats potentially affected by construction and decommissioning are likely to recover during the operations and maintenance phase.</p> <p>Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Collision risk	✗	✓	✗	<p>Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Barrier effects	✗	✓	✗	<p>Barrier effects may arise in addition to displacement. However, because the effect will only arise during the operations and maintenance phase, there will be no inter-related effects across the project phases of the Mona Offshore Wind Project.</p> <p>Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Receptor-led effects

Potential exists for spatial and temporal interactions between disturbance and displacement, indirect disturbance and displacement resulting from changes to prey species and habitats during the project's lifetime.

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

- Combined disturbance, displacement, and changes in prey species during construction;
- Combined collision risk, displacement and barrier effects during operation and maintenance.

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

Individual impacts were assigned a significance of negligible to minor as standalone impacts and although potential combined impacts may arise, it is important to recognise that some of the activities potentially resulting in combined effects are mutually exclusive. Species cannot simultaneously exhibit a high level of avoidance (displacement effect) and a high level of collision risk (collision effect). Furthermore, there are differences in the species' susceptibility to the collision and displacement effects. Typically, species that forage on the wing (surface feeders (e.g. gulls)) will be more susceptible to collision risk and less affected by displacement as they move quickly between feeding opportunities – thus more likely to fly within rotor height. In contrast, sub-surface feeders and in particular species diving at great depths (e.g. Manx shearwater, divers and auks) would be more susceptible to displacement/disturbance: they feed for a prolonged period of time and fly less frequently between feeding patches, and thus at much-reduced level of collision risk.

Description of impact	Phase ^a Likely significant inter-related effects			Inter-related significance
	C	O	D	

Two species were assessed for the combined impact of displacement and collision risk: black-legged kittiwake and northern gannet. For both these species, the combined impact was of minor adverse significance, which is not significant in EIA terms.

Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.

15.6.3 Human environment

Commercial fisheries

- 15.6.3.1 For commercial fisheries, the following potential impacts have been considered within the inter-related assessment:
- Loss or restricted access to fishing grounds
 - Displacement of fishing activity into other areas
 - Interference with fishing activity
 - Loss or damage to fishing gear due to snagging
 - Potential impacts on commercially important fish and shellfish resources
 - Supply chain opportunities for local fishing vessels
 - Potential impacts on commercial fisheries as a result of increased risk of introduction and spread of INNS.
- 15.6.3.2 Table 15.11 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for commercial fisheries receptors.
- 15.6.3.3 As previously noted, commercial fisheries receptors and fish and shellfish receptors are linked and the inter-related effects associated with potential impacts on commercially important fish species has been fully assessed in volume 2, chapter 11: Commercial fisheries of the PEIR, with effects of minor adverse significance predicted for all project phases.

Table 15.11: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – commercial fisheries

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Loss or restricted access to fishing grounds	✓	✓	✓	<p>During the construction and decommissioning phases of the project, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. During construction, for example, fishing will be excluded from 500m safety zones around wind turbines and OSPs. During operation, all commercial fisheries receptor groups will be able to continue fishing within the Mona Array Area. A negligible effect is predicted for all receptor groups with the exception of Scottish west coast scallop vessels, which will be able to continue fishing but would be severely restricted due to the presence of the offshore infrastructure and the minimum spacing between turbines; combined with their limited spatial tolerance and dependence on the area, it is predicted that the effect on this receptor will be moderate adverse.</p> <p>While access may be restricted due to the presence of the offshore infrastructure and the minimum spacing between wind turbines during operation, during construction and decommissioning vessels will be able to operate across the Mona Array Area where activity is not taking place. While there will be a small incremental increase in the area in which fishing may be disrupted as the project is built out, as fishing activity is likely to be able to continue elsewhere during all project phases, effects on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Displacement of fishing activity into other areas	✓	✓	✓	<p>During operation, the Scottish west coast scallop vessels may be restricted from fishing within the Mona Array Area due to the presence of the offshore infrastructure and the minimum spacing between wind turbines. This receptor group has limited spatial tolerance due to significant dependence upon the commercial fisheries study area for queen scallop dredging. However, it is noted that the other mobile gear receptor groups and offshore static gear vessels target a relatively large area in comparison to the Mona Array Area. It is also currently understood that a spatial 'gentleman's agreement' exists between the different gear types in operation in this area and it is assumed that this would continue during the operational and maintenance phase.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Interference with fishing activity	✓	✓	✓	<p>Smaller vessel sizes associated with inshore static gear vessel and offshore static gear vessel receptor groups may be affected by the presence of construction vessels during the construction and decommissioning phases within the Mona Offshore Cable Corridor. The marker buoys and actual gear deployed by the inshore static gear vessels are vulnerable to potential interference by construction vessels, due to their poor visibility. Although operational and maintenance vessel traffic will add to the existing level of shipping activity in the area, there are already moderate levels of vessel traffic in the area, and there is co-existence of fishing vessels with other marine traffic.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Loss or damage to fishing gear due to snagging	✓	✓	✓	<p>The construction, operational and maintenance and decommissioning of the Mona Array Area and Mona Offshore Cable Corridor may lead to loss or damage to fishing gear due to snagging. Snagging risks may occur as a result of infrastructure on the seabed, such as inter-array cables, offshore export cables and associated cable protection.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Potential impacts on commercially important fish and shellfish resources	✓	✓	✓	<p>Impacts to prey species (i.e. fish and shellfish) will be at their maximum during the construction phase as a result of effects associated with underwater noise from piling, increased suspended sediments and habitat loss.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Supply chain opportunities for local fishing vessels	✓	✓	✓	<p>During the construction, operational and maintenance and decommissioning of the Mona Offshore Wind Project, there may be the opportunity for commercial fisheries operators to provide support to the Project, such as guard vessels and scouting surveys.</p>	No change resulting from inter-related assessment

Description of impact	Phase ^a Likely significant inter-related effects			Inter-related significance
	C	O	D	
			Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	
Potential impacts on commercial fisheries as a result of increased risk of introduction and spread of INNS	✓	✓	<p>As assessed in chapter 7: Benthic subtidal and intertidal ecology of the PEIR, no significant effects are likely to occur as a result of the risk of introduction and spread of INNS during the construction, operational and maintenance and decommissioning phases.</p> <p>Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Receptor-led effects

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

There is potential for an inter-related effect from the combination of the loss or restricted access to fishing grounds and the consequent displacement of fishing activity into other areas. This could result in increased gear conflict and pressure on other fishing grounds. During construction, static gear vessels may be required to relocate pots from areas of activity, which could increase intensity of activity in other areas or cause conflict with mobile gear species (e.g. scallop vessels). However, with successful implementation of the measures outlined in volume 2, chapter 11: Commercial fisheries of the PEIR, and the temporary nature of the works, it is not predicted that there will be any inter-related effect of greater significance than those already assessed in isolation.

During the operational phase of the Mona Offshore Wind Project, there will be no complete exclusions to mobile or static vessels, however some mobile gear vessels may choose not to fish within the Mona Array Area due to risks associated with the minimum spacing of wind turbines; this could result in conflict with static gear vessels or other mobile gear vessels and increase pressure on other fishing grounds. With consideration of the measures outlined in volume 2, chapter 11: Commercial fisheries of the PEIR, it is anticipated that the appropriately mitigated loss of access will reduce displacement and, therefore, any inter-related effect will not be of greater significance than those assessed in isolation.

Shipping and navigation

- 15.6.3.4 For shipping and navigation, the following potential impacts have been considered within the inter-related assessment:
- Displacement/interference of fishing activity
 - Collision and allision risk of fishing vessels
 - Interference with oil and gas activities
 - Impact on emergency response capability
 - Impact on marine navigation, communications and positioning systems
- 15.6.3.5 Table 15.12 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for shipping and navigation receptors.
- 15.6.3.6 As previously noted, effects on shipping and navigation, due to an increase in vessels numbers also has the potential to have direct effects on marine mammals which has been fully assessed in volume 2, chapter 9: Marine mammals of the PEIR, with effects of minor adverse significance predicted across all project phases and volume 2, chapter 10: Offshore ornithology of the PEIR with effects of no greater than minor adverse significance across all project phases.

Table 15.12: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – shipping and navigation.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Displacement/interference of fishing activity	✓	✓	✓	<p>Displacement of fishing activity due to the presence of the Mona Offshore Wind Project and avoidance of other vessels.</p> <p>These impacts are assessed in volume 2, chapter 11: Commercial fisheries. The Navigational Risk Assessment (NRA) conducted in volume 2, chapter 12: Shipping and navigation was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same.</p> <p>Across the project lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Collision and allision risk of fishing vessels	✓	✓	✓	<p>Displacement of fishing activity due to the presence of the Mona Offshore Wind Project increases the risk of collision or allision of fishing vessels.</p> <p>These impacts are assessed within this chapter but further details on fishing activity are provided in volume 2, chapter 11: Commercial fisheries. The NRA conducted in volume 2, chapter 12: Shipping and navigation was of sufficient detail that interactions between effects were considered, both from different phases and different receptors.</p> <p>Across the project lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Interference with oil and gas activities	✓	✓	✓	<p>The proximity of oil and gas assets and the movements of supply ships would be impacted by the presence of the Mona Offshore Wind Project.</p> <p>These impacts are assessed in volume 2, chapter 14: Other sea users. The NRA conducted in volume 2, chapter 12: Shipping and navigation was of sufficient detail that interactions between effects were considered, both from different phases and different receptors.</p> <p>Across the project lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Impact on emergency response capability	✓	✓	✓	<p>The need for SAR assets to enter the Mona Array Area has impacts upon aviation receptors.</p> <p>These impacts are assessed in volume 5, chapter 27: Aviation and Radar. The NRA conducted in volume 2, chapter 12: Shipping and navigation was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same.</p> <p>Across the project lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Impact on marine navigation, communications position fixing equipment	✓	✓	✓	<p>Impacts to shore-based radar may occur in addition to marine radar.</p> <p>These impacts are assessed in volume 4, chapter 27: Aviation and Radar. The NRA conducted in volume 2, chapter 12: Shipping and navigation was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same.</p> <p>Across the project lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Receptor-led effects

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

Across the project lifetime, the additive effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.

Aviation and radar

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

Table 15.13: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – aviation and radar.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Creation of physical obstacle to aircraft operations	✓	✓	✓	The individual standalone impacts were assigned significance of no greater than minor adverse. ATS provision and the rules of air, including the 'see and be seen principle', will mean reduced potential for interrelated effects for helicopter operators and the MOD alike, operating at low level in the airspace surrounding the Mona Array Area. Across the project lifetime, the effects on aviation and radar receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Wind turbines causing interference on civil and military primary surveillance radar systems	✗	✓	✗	This effect will only arise during the operations and maintenance phase. Across the project lifetime, the effects on aviation and radar receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment

Receptor-led effects

Potential exists for spatial and temporal interactions between direct impacts to Aviation and radar receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise from the following:

- The interaction of the disruption to helicopters using HMRs, impact on available airspace, and disruption to cross-zone transit helicopter traffic on the same receptor (helicopter operator). Helicopters using HMRs may need to deviate around the Mona Array Area and may also be affected by increased helicopter traffic and associated impacts on available airspace. Where helicopters are using an HMR that is deviated around the Mona Array Area, the deviation itself would mean that there is unlikely to also be an interaction with the impact of disruption to cross-zone helicopter traffic (and vice-versa). Helicopter flights in the UK are highly regulated and the same rules of the air and Air Traffic Control (ATC) services will continue to apply to helicopter operators within the east Irish Sea. No significant inter-related effect has therefore been identified.
- The disruption of helicopter access to oil and gas platforms, drilling rigs and operational vessels and disruption of vessel access to oil and gas platforms and subsea infrastructure on the same receptor (oil and gas licence block operator). It is possible for both helicopter and vessel access to existing and future infrastructure to be disrupted by the presence of the Mona Offshore Wind Project. Disruption of vessel access to oil and gas platforms and subsea infrastructure has been assessed as minor adverse (see chapter 11: Infrastructure and Other Users). There are no currently licenced blocks within the local other sea users study area. Disruption of helicopter access to oil and gas platforms, drilling rigs and operational vessels has been assessed as minor adverse. The MOD, ATC service providers and helicopter operators have been consulted with regard to the potential for the Mona Offshore Wind Project to create an obstruction to aviation activities conducted in the vicinity of construction infrastructure, operations and maintenance activities, and decommissioning activities. Therefore, the significance of these combined effects on oil and gas operators will not be of any greater significance than the effects when assessed in isolation.

Marine archaeology

- 15.6.3.10 For marine archaeology, the following potential impacts have been considered within the inter-related assessment:
- Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors
 - Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)
 - Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors)
 - Alteration of sediment transport regimes
- 15.6.3.11 Table 15.14 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for marine archaeology receptors.
- 15.6.3.12 As previously noted, marine archaeology and physical processes (i.e. sediment deposition) are linked receptors and the inter-related effects associated with a change to marine archaeological receptors has been fully assessed in volume 2, chapter 13: Marine archaeology of the PEIR, with effects of minor adverse significance predicted during construction.

Table 15.14: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – marine archaeology.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	The construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. Impacts of sediment disturbance and deposition during each project phase have the potential to expose previously unrecorded marine archaeology receptors, and also to bury or partially bury known marine archaeology receptors. Across the project lifetime, the effects on marine archaeology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Alteration of sediment transport regimes	✗	✓	✗	This effect will only arise during the operations and maintenance phase. Across the project lifetime, the effects on marine archaeology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment

Receptor-led effects

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

- Combined effects on different elements of the historic environment (e.g. submerged prehistoric receptors and wrecks). The mitigation measures proposed for the Mona Offshore Wind Project will minimise combined effects on different elements of the historic environment. This includes implementation of Archaeological Exclusion Zones (AEZs) to avoid sites of identified archaeological significance as well as micro-siting of wind turbines to avoid archaeological constraints. It is therefore, predicted that any inter-related effect will not be of any greater significance than those impacts already assessed in isolation (i.e. minor adverse).
- The direct physical impact on marine archaeology receptors interacting with indirect impacts from sediment disturbance and deposition which may lead to further damage to the same receptor, due to increased exposure. The combined inter-related effect will be minimised by the implementation of AEZs so that it will not be of any greater significance than those direct and indirect impacts already assessed in isolation (i.e. minor adverse).

Other sea users

- 15.6.3.13 For other sea users, the following potential impacts have been considered within the inter-related effects assessment:
- Displacement of recreational activities
 - Increased SSC and associated deposition affecting recreational diving and bathing sites
 - Impacts to existing cables or pipelines or restrictions on access to cables or pipelines
 - Increased SSC and associated deposition affecting aggregate extraction areas
 - Alterations to sediment transport pathways affecting aggregate extraction areas
 - Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Mona Array Area
 - Interference with the performance of Radar Early Warning Systems (REWS) located on oil and gas platforms
 - Interference with offshore microwave fixed communication links.
- 15.6.3.14 Table 15.16 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and also the inter-related effects (receptor-led effects) that are predicted to arise for other sea users receptors.
- 15.6.3.15 As previously noted, other sea users receptors and physical processes are linked receptors and the inter-related effects (i.e. a change to the sediment regime) on aggregate receptors has been fully assessed in volume 2, chapter 14: Other sea users of the PEIR, with effects of minor significance predicted across all project phases.
- 15.6.3.16 Infrastructure and other users receptors and Aviation and radar receptors are also linked receptors and the inter-related effects (i.e. restriction on access to infrastructure by vessel and helicopter) are described in Table 15.16 below, with effects of minor adverse significance predicted.

Table 15.15: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – other sea users.

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Displacement of recreational activities	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases, the presence of infrastructure, safety zones and advisory safety distances, may lead to the displacement of recreational activities such as recreational sailing, water sports and fishing from the Mona Array Area and along the Mona Offshore Cable Corridor. The level of recreational activity within the Mona Array Area is low. There is low to medium recreational vessel activity in nearshore areas of the Mona Offshore Cable Corridor, with boating and water sports taking place closer to shore. There is the potential for loss of recreational resource during nearshore/inshore cable installation activities in the construction phase however any displacement along the Mona Offshore Cable Corridor will be temporary and is not likely to result in inter related effects.</p> <p>Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased suspended sediment concentrations and associated deposition affecting recreational diving and bathing sites	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases the installation, maintenance and removal of infrastructure has the potential to increase SSC within the water column. There is potential that sediment plumes from resuspended sediment could impact recreational areas through changes to water quality. The impact will be of regional spatial extent and medium term duration.</p> <p>Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases existing cables and pipelines may be affected where they are crossed by Mona Offshore Wind Project cables. In addition, access to existing cables and pipelines may be restricted during construction, maintenance and decommissioning activities due to the presence of Mona Offshore Wind Project infrastructure, safety zones and advisory safety distances.</p> <p>Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Increased suspended sediment concentrations and associated deposition affecting aggregate extraction areas	✓	✓	✓	<p>During the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project, the installation, maintenance and removal of infrastructure has the potential to increase SSC within the water column and to deposit disturbed sediments on the surrounding seabed. There is potential that sediment plumes from resuspended sediment could impact aggregate areas through sedimentation and the potential that this could affect the quality of aggregate (coarse sand deposits). It is important to note that there are no aggregate extraction areas within the Mona Array Area or the Mona Offshore Cable Corridor.</p> <p>Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment
Alterations to sediment transport pathways affecting aggregate extraction areas	✓	*	✓	<p>During the construction, operations and maintenance and decommissioning phases, the installation, maintenance and removal of infrastructure has the potential to alter sediment transport pathways affecting aggregate extraction areas. Any alterations to sediment transport pathways affecting aggregate extraction areas will be gradual as the presence of infrastructure increases. As stated above, there are no aggregate extraction areas within the Mona Array Area or the Mona Offshore Cable Corridor. The impacts identified are only for the construction and decommissioning phases so it was concluded that the presence of the Mona Offshore Wind Project will not result in a change to regional sediment transport pathways that would indirectly affect aggregate resources. During the decommissioning phase any alterations to sediment transport pathways affecting aggregate extraction areas would gradually decrease as structures are removed and cut below the seabed.</p> <p>Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.</p>	No change resulting from inter-related assessment

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Mona Array Area	✓	✓	✓	Drilling and the placement of infrastructure will be restricted within the Mona Array Area, with a 500m rolling advisory safety zones around cable installation vessels during the construction phase, and 500m safety zones established around infrastructure such as wind turbines during periods of major maintenance. As infrastructure is installed, the area available for seismic surveys and drilling will be restricted, and the presence of safety zones around infrastructure and vessels may also further restrict the ability to use certain alternative survey methods. The effects of decommissioning activities are expected to be the same or similar to the effects from construction. Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	No change resulting from inter-related assessment
Interference with the performance of REWS located on oil and gas platforms	✗	✓	✗	These effects will only arise during the operations and maintenance phase. Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the PEIR.	To be addressed in Environmental Statement
Interference with offshore microwave fixed communication links	✗	✓	✗		To be addressed in Environmental Statement

Receptor-led effects

Potential exists for spatial and temporal interactions between direct and indirect impacts to infrastructure and other user receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise from the following:

- The interaction of the physical restriction of seismic survey activity and the interference of piling noise with seismic survey activity on the same receptor (oil and gas licence block operator). The operator of a licence block will typically conduct seismic survey activity, drilling and the laying of infrastructure in a progressive order within a licence block. Restrictions on seismic survey activity, physically or due to noise interference, may therefore prevent the potential for drilling and so has an interactive effect. None of the licence blocks within the Mona Array Area are currently licensed, however block 110/12a is licensed and adjacent to the Mona other sea users local study area and as such may be impacted by noise interference. This potential inter-related effect is considered and presented in Table 15.16. Consultation with the operators of the blocks in proximity to the Mona Array Area has aimed to establish a line of communication to ensure coexistence can be achieved any future operational issues can be addressed. Any future operator of the unlicensed blocks will be aware of the Mona Offshore Wind Project and will have taken potential coexistence into consideration.
- The interaction of the physical presence of wind turbines within the Mona Array Area on REWS and the deviation of shipping routes towards platforms with REWS installed. The displacement of shipping routes and its impact on oil and gas platforms will be assessed and presented in the Environmental Statement.
- The interaction or disruption of vessel access to oil and gas platforms and subsea infrastructure and disruption of helicopter access to oil and gas platforms, drilling rigs and operational vessels and subsea infrastructure on the same receptor (oil and gas licence block operator). This potential inter-related effect is considered and presented in (volume 2, chapter 12: Shipping and navigation and volume 2, chapter 27: Aviation and radar of the PEIR).

Seascape, landscape and visual resources

- 15.6.3.17 For Seascape, landscape and visual resources, the following potential impacts have been considered within the inter-related assessment:
- Seascape impacts – potential change to seascape and marine character through the introduction of the Mona Offshore Wind Project infrastructure
 - Landscape impacts – potential change to landscape character through the introduction of the Mona Offshore Wind Project infrastructure
 - Visual receptor impacts – changes to the visual baseline scenario may cause effects on a variety of visual receptors.
- 15.6.3.18 Table 15.16 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project, and also the inter-related effects (receptor-led effects that are predicted to arise for seascape, landscape and visual resources and receptors.

Table 15.16: Summary of likely significant inter-related effects on the environment for individual effects occurring across the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project and from multiple effects interacting across all phases (receptor-led effects) – seascape, landscape and visual resources.

^a C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase ^a			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Seascape impacts – potential change to seascape and marine character through the introduction of the Mona Offshore Wind Project infrastructure	✓	✓	✓	<p>The potential effects of the presence of the Mona Offshore Wind Project within the seascape and marine character areas is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of potential effects is likely to be high in relation to the array area itself and diminishing with distance from the array area. The scale of effects will also increase through the construction phase and remain throughout operations and maintenance, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on seascape and marine character resources are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.</p> <p>Across the project lifetime, the effects on seascape, landscape and visual resources’ 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.</p>	No change resulting from inter-related assessment
Seascape impacts – potential change to seascape and marine character through the introduction of the Mona Offshore Wind Project infrastructure	✓	✓	✓	<p>The potential effects of the presence of the Mona Offshore Wind Project within the seascape and marine character areas is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of potential effects is likely to be high in relation to the array area itself and diminishing with distance from the array area. The scale of effects will also increase through the construction phase and remain throughout operations and maintenance, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on seascape and marine character resources are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.</p> <p>Across the project lifetime, the effects on seascape, landscape and visual resources’ 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.</p>	No change resulting from inter-related assessment
Landscape impacts - potential change to landscape character through the introduction of the Mona Offshore Wind Project infrastructure	✓	✓	✓	<p>The potential effects of the presence of the Mona Offshore Wind Project on landscape character areas is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of effects will increase through the construction phase and remain throughout operations and maintenance, decreasing again through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on landscape character resources are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.</p> <p>Across the project lifetime, the effects on seascape, landscape and visual resources’ 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.</p>	No change resulting from inter-related assessment

Receptor-led effects

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

15.7 Summary

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

15.8 Conclusion

15.8.1.1 This chapter has defined the potential inter-related effects considered to arise from the Mona Offshore Wind Project. Project lifetime and receptor-led effects have been defined in order to differentiate the two types of inter-related effects that may arise as a result of the Mona Offshore Wind Project.

15.8.1.2 Based on one or a combination of the following factors: the low sensitivity of receptors; temporary and small scale nature of effects; availability of alternative habitats; and also factoring in proposed mitigation measures adopted as part of the project, the overall significance of any inter-related effects is not judged to increase above the significance value assessed for individual effects in the topic-specific chapters.

15.9 References

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