Spiorad na Mara Offshore Wind Farm

Offshore Project

Environmental Impact Assessment Report

Chapter 13: Marine Mammals, Volume 2a

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Contents

List of Tables

List of Plates

13 MARINE MAMMALS

13.1 INTRODUCTION

13.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) presents the results of the assessment of the likely significant effects of the proposed Spiorad na Mara Offshore Wind Farm (hereafter referred to as ‘the Offshore Project’) with respect to Marine Mammals, including cetaceans (whales, dolphins and porpoises) and pinnipeds (seals).

13.1.1.2 This chapter should be read in conjunction with the project description provided in **Chapter 3: Project Description, Volume 1a** and the relevant parts of the following chapters and appendices:

- **Chapter 10: Marine Sediment and Water Quality, Volume 2a:** Changes in marine water and sediment quality can result in adverse effects on invertebrate and fish receptors, which marine mammals prey on;
- **Chapter 11: Benthic and Intertidal Ecology, Volume 2a:** Changes to benthic and shellfish assemblages have the potential to affect marine mammal receptors, due to their reliance on benthos and shellfish as prey items;
- **Chapter 12: Fish Ecology, Volume 2a:** Changes to fish assemblages have the potential to affect marine mammal receptors, due to their reliance on fish as prey items;
- **Chapter 16: Shipping and Navigation, Volume 2a:** Changes in shipping and navigational routes as a result of the Offshore Project have the potential to affect marine mammal receptors;
- **Outline Navigational Safety and Vessel Management Plan (NSVMP), Volume 3:** Provides details of the proposed approach to managing vessel activities associated with the Offshore Project;
- **Chapter 21: Commercial Fisheries, Volume 2a:** Changes to fish assemblages, including fish species which are commercially important, have the potential to affect marine mammal receptors, due to their reliance on fish as prey items;
- **Outline Offshore Environmental Management Plan (Outline OEMP), Volume 3:** Specifies how environmental management measures will be implemented;
- **Outline Marine Mammal Mitigation Protocol (Outline MMMP), Volume 3:** Describes the measures and procedures to minimise potential impacts on marine mammal receptors associated with the Offshore Project;
- **Marine Pollution Contingency Plan (MPCP), Volume 3:** Sets out the proposed framework for preventing, responding to, and managing potential marine pollution incidents during the lifetime of the Offshore Project;
- **Outline Offshore Operational and Maintenance Plan (Outline OMP), Volume 3**: Outlines the approach and detail around operation and maintenance (O&M) activities, ensuring environmental compliance and minimising impacts on marine receptors.

13.1.1.3 This technical chapter describes the following:

- Legislation, planning policy and other documentation that has informed the assessment (Section 13.2: Summary of policy and legislative context and **Chapter 2: Policy and Legislative Context, Volume 1a**);
- Outcome of consultation and engagement that has been undertaken to date, including how matters relating to Marine Mammals have been addressed (Section 13.3: Scoping and consultation);
- Scope of the assessment for Marine Mammals (Section 13.4: Scope of the assessment);
- The methods of assessment used for baseline data gathering and impact assessment (Section 13.5: Methodology for baseline data gathering and impact assessment);
- Overall baseline (Section 13.6: Baseline conditions);
- Embedded environmental measures relevant to Marine Mammals and the relevant maximum design scenario (Section 13.7: Basis for Environmental Impact Assessment);
- Assessment of Marine Mammals likely significant effects and further mitigation (Section 13.8-13.10);
- Assessment of Marine Mammals combined effects (Section 13.11: Assessment of Combined Effects);
- Consideration of additive interactions between the Offshore Project and Onshore Transmission Works (OTW) on Marine Mammals (Section 13.12: Consideration of Onshore Transmission Works);
- Assessment of Marine Mammals cumulative effects (Section 13.13: Assessment of Cumulative Effects);
- Assessment of transboundary effects (Section 13.14: Transboundary Effects)
- A summary of residual effects for Marine Mammals (Section 13.15: Summary of residual effects);
- Information sources and documentation referred to in this chapter (Section 13.17: References).

13.1.1.4 The chapter is supported by the following figures and appendices:

- **Figure 13.1: Location of Marine Mammal Study Area and Marine Mammal Management Units in Relation to the Project, Volume 2b;**
- **Figure 13.2: Designated Sites for Marine Mammals, Volume 2b;**
- **Figure 13.3: Modelled Surface Density Estimates of SCANS-III Data for Harbour Porpoise, Volume 2b;**
- **Figure 13.4: Modelled Surface Density Estimates of SCANS-III Data for White-Beaked Dolphin, Volume 2b;**
- **Figure 13.5: Modelled Surface Density Estimates of SCANS-III Data for Common Dolphin, Volume 2b;**
- **Figure 13.6: Modelled Surface Density Estimates of SCANS-III Data for Bottlenose Dolphin, Volume 2b;**

- **Figure 13.7: Modelled Surface Density Estimates of SCANS-III Data for Pilot Whale, Volume 2b;**
- **Figure 13.8: Modelled Surface Density Estimates of SCANS-III Data for Beaked Whale Species, Volume 2b;**
- **Figure 13.9: Modelled Surface Density Estimates of SCANS-III Data for Minke Whale, Volume 2b;**
- **Figure 13.10: Modelled Surface Density Estimates of SCANS-III Data for Fin Whale, Volume 2b;**
- **Figure 13.11: Mean at-sea Distribution (Relative Density) of Grey Seals from Haul-outs in the UK and Ireland, Volume 2b;**
- **Figure 13.12: Mean at-sea Distribution (Relative Density) of Harbour Seals from Haul-outs in the UK and Ireland, Volume 2b;**
- **Figure 13.13: Noise contours and predicted disturbance response for harbour porpoise in the West Scotland MU to piling worst case (Location 6), Volume 2;**
- **Figure 13.14: Noise contours and predicted disturbance response for white-beaked dolphin in the UK portion of the Celtic and Greater North Seas MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.15: Noise contours and predicted disturbance response for common dolphin in the UK portion of the Celtic and Greater North Seas MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.16: Noise contours and predicted disturbance response for bottlenose dolphin in the Coastal West Scotland and Hebrides MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.17: Noise contours and predicted disturbance response for bottlenose dolphin in the Oceanic Waters MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.18: Noise contours and predicted disturbance response for Risso's dolphin in the UK portion of the Celtic and Greater North Seas MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.19: Noise contours and predicted disturbance response for Atlantic white-sided dolphin in the UK portion of the Celtic and Greater North Seas MU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.20: Noise contours and predicted disturbance response for long-finned pilot whale to piling worst case (Location 6), Volume 2b;**
- **Figure 13.21: Noise contours and predicted disturbance response for killer whale to piling worst case (Location 6), Volume 2b;**
- **Figure 13.22: Noise contours and predicted disturbance response for beaked whale species to piling worst case (Location 6), Volume 2b;**
- **Figure 13.23: Noise contours and predicted disturbance response for minke whale in the UK portion of the Celtic and Greater North Seas MU to piling worst case (Location 6), Volume 2b;**

- **Figure 13.24: Noise contours for humpback whale to piling worst case (Location 6), Volume 2b;**
- **Figure 13.25: Noise contours and predicted disturbance response for fin whale to piling worst case (Location 6)**
- **Figure 13.26: Noise contours and predicted disturbance response for grey seal in the Western Isles SMU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.27: Noise contours and predicted disturbance response for harbour seal in the Western Isles SMU to piling worst case (Location 6), Volume 2b;**
- **Figure 13.28: Other developments considered as part of the marine mammals CEA, Volume 2b;**
- **Appendix 13.1: Digital Aerial Bird and Marine Megafauna Surveys, Volume 2c**;
- **Appendix 13.2: Passive Acoustic Monitoring Survey Report, Volume 2c**;
- **Appendix 13.3: Underwater Noise Modelling Assessment, Volume 2c;**
- **Appendix 13.4: Marine Mammal Population Modelling, Volume 2c**.

13.2 SUMMARY OF POLICY AND LEGISLATIVE CONTEXT

13.2.1.1 This section outlines the legislation, policy and guidance that is relevant to the assessment of likely significant effects on Marine Mammals associated with the construction, operation, maintenance and decommissioning of the Offshore Project. In addition, other national, regional, and local policies are considered within this assessment where they are judged to be relevant. Further information on policies relevant to the EIAR is provided in **Chapter 2, Volume 1a**.

13.2.1.2 A summary of the legislation, policy and guidance relevant to Marine Mammals is provided in **Table 13-1** which examined their relevance to the assessment.

Table 13-1 Legislation and Policy in relation to Marine Mammals

Title	**Relevance to Marine Mammals**
International Legislation	
Agreement on Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)	The aim of this agreement is to promote close cooperation amongst parties with a view to achieving and maintaining a favourable conservation status for small cetaceans in the ASCOBANS area.
European Union (EU) Habitats Directive (Council Directive 92/43/European Economic Community (EEC))	The Habitats Directive aims to conserve natural habitats and wild flora and fauna in the EU. Marine mammal species are included within Annexes II, IV and V of the Directive.
Marine Strategy Framework Directive (MSFD)	This EU framework sets out measures for Good Environmental Status (GES) in the marine environment. Descriptor 11 is relevant to marine mammals: introduction of energy, including

Title	Relevance to Marine Mammals
	underwater noise, is at levels that do not adversely affect the marine environment.
The Convention on the Conservation of Migratory Species of Wild Animals (CMS) (the Bonn Convention)	The Bonn Convention aims to protect species that need or could significantly benefit from international co-operation within Appendix II, in which all marine mammals are listed.
The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention)	The Bern Convention aims to conserve and protect wild flora and fauna species and their habitats. Marine mammal species listed under the Convention are included within Annex II: Strictly protected fauna species.
The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention)	The OSPAR Convention is the legal instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic (NEA).
The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019	Applies EU legislation relevant to the marine environment to Scotland/*Alba* and ensures legislation remains in effect post-Brexit.
National Legislation/Policy	
Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)	This legislation enacts the provisions of the EU Habitats Directive, amended to provide a continued mechanism for site designation and protection following the United Kingdom's (UK's) departure from the EU. The regulations apply in Scotland/*Alba*, including for marine mammal species listed in Annexes II, IV and V of the Directive.
Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 (as amended)	These Regulations implement the requirements of the EU Habitats Directive in offshore waters (>12 nm from the coast). Species in Schedules 1, 2 and 3, which include marine mammals, are protected.
Wildlife and Countryside Act 1981 (as amended)	All cetaceans are listed under Schedule 5 of the Act, which makes it an offence to intentionally or recklessly kill, injure or take any wild animal listed under the Schedule.
Nature Conservation (Scotland) Act 2004	The Act sets out a series of measures which are designed to conserve biodiversity and to protect and enhance the biological natural heritage of Scotland/*Alba*. The Act contains provisions for Scottish Natural Heritage ((SNH), now known as NatureScot) to create a Scottish Marine Wildlife Watching Code.

Title	Relevance to Marine Mammals
Marine (Scotland) Act 2010	The Act introduces a duty to protect and enhance the marine environment, including the designation of seal haul-out sites to provide additional protection for seals from intentional or reckless harassment. The Act includes a duty to protect and enhance marine habitats between 12 and 200 nm to sea in Scotland/*Alba*.
Marine and Coastal Access Act 2009	The Marine and Coastal Access Act 2009 introduces a sustainable management framework for the UK covering waters beyond 12 nm in Scotland.
Scotland's National Marine Plan (NMP)	Policies within Scotland's NMP with relevance to marine mammals include GEN 9, GEN 13 and GEN 21.
The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended)	The revised plan to implement seal haul-out and breeding sites in Scotland/*Alba*. A total of 194 sites were designated through this Act in 2014, with an additional site at the Ythan Estuary acknowledged in 2017.
Marine Strategy Regulations 2010	The Regulations transpose the requirements of the EU Marine Strategy Framework Directive into UK legislation and require the UK to achieve or maintain GES in the marine environment. Descriptor 11: *Energy including Underwater Noise* is relevant to marine mammals.
Wildlife and Natural Environment (Scotland) Act 2011	This regulation protects cetacean species including harbour porpoises, bottlenose dolphins and common dolphins and makes it an offence to kill or take animals by certain methods.
Sectoral Marine Plan for Offshore Wind Energy (2020)	Confirms Plan Options for ScotWind leasing round, including N4.
Technical Guidance	
Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al.*, 2019)	This publication provides information on functional hearing groups for marine mammals. Auditory thresholds for temporary threshold shift (TTS) and permanent threshold shift (PTS) are presented.
Joint Nature Conservation Committee (JNCC) guidelines for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010)	This document outlines mitigation guidelines for underwater noise impacts arising from pile driving in the marine environment in order to reduce risk of injury.
JNCC guidelines for minimising the risk of injury to marine mammals from explosive use in the marine environment (JNCC, 2025)	These guidelines outline measures to minimise potential injury from the use of explosives in activities such as construction, offshore decommissioning and clearance of unexploded ordnance.

Title	Relevance to Marine Mammals
JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017)	These guidelines outline measures to minimise potential injury to marine mammals from geophysical surveys.
The protection of Marine European Protected Species (EPS) from injury and disturbance. Guidance for Scottish Inshore Waters (July 2020 Version) (Marine Scotland, 2020)	This guidance provides advice for marine users who are planning to carry out an activity which has the potential to kill, injure or disturb an EPS, including any cetacean in Scottish waters.
Guidance on the Offence of Harassment at Seal Haul-out Sites (Marine Scotland, 2014)	This report provides information and guidance on designated haul-out sites, guidance on seal harassment and laws relevant to seal disturbance.
Scottish Marine Wildlife Watching Code (NatureScot, 2017)	This code of conduct provides recommendations, advice and information for commercial and leisure activities associated with wildlife watching in Scotland/*Alba*.
Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute for Ecology and Environmental Management (CIEEM), 2024)	This document provides guidelines for carrying out ecological Environmental Impact Assessment (EIA) reporting including baseline and impact assessment sections.
Marine environment: unexploded ordnance clearance Joint Position Statement (UK Government, 2025)	This joint statement sets out the collective position of the UK Government, devolved governments and associated bodies on the use of low-noise methods of clearing Unexploded Ordnances (UXOs) within the UK marine environment, in relation to commercial marine developments.
Identification of Priority Marine Features in Scottish offshore waters (JNCC, 2012)	The purpose of identifying Priority Marine Features (PMFs) is to guide policy decisions regarding the conservation of Scotland/*Alba*'s seas. All marine mammals present in Scottish waters are PMFs.

13.3 SCOPING AND CONSULTATION

13.3.1 OVERVIEW

13.3.1.1 This section describes the stakeholder engagement undertaken for the Offshore Project. This consists of early engagement, the outcome of, and response to, the Scoping Opinion in relation to the Marine Mammals assessment, informal consultation and consultation undertaken though the Preliminary Application Consultation (PAC) process (hereafter referred to as the 'formal consultation'). An overview of engagement undertaken for the Project as a whole can be found in **Chapter 5: Approach to EIA, Volume 1a** and **Appendix 5.4: Stakeholder Consultation and Engagement, Volume 1c.**

13.3.1.2 Consultation is a key feature of the EIA process and continues throughout the lifecycle of the Offshore Project, from the initial stages through to consent and post consent.

13.3.1.3 Consultation captures all consultation and engagement and has been ongoing with a number of prescribed and non-prescribed consultation bodies and local authorities in relation to Marine Mammals. All consultation to date has been undertaken in line with the process described in **Chapter 5, Volume 1a** and **Appendix 5.4, Volume 1c**. Feedback received during this process has been incorporated into the EIAR wherever possible as appropriate.

13.3.2 EARLY ENGAGEMENT

13.3.2.1 Early engagement with Marine Directorate – Science, Evidence, Data and Digital (MD-SEDD), Marine Directorate – Licensing Operations Team (MD-LOT), NatureScot and the Hebridean Whale and Dolphin Trust (HWDT) was undertaken in the form of a stakeholder workshop on 23 May 2023, to inform EIA scoping. Further details of the consultation undertaken and the post-workshop feedback can be found in Section 5.3 and Table 5.3-1 of the Scoping Report (Spiorad na Mara Limited, 2023). Key comments from the May 2023 workshop are included within **Table 13-2**.

Table 13-2 Early Engagement – Marine Mammals

Comment	Response/where this is addressed in the EIAR
NatureScot confirmed that they were content with the data sources used in the scoping chapter and the 2 years of Digital Aerial Survey (DAS). Carter *et al.*, 2022 was recommended for the seal baseline.	Data sources used are presented within **Table 13-8**, which includes Carter *et al.*, 2022. Site-specific surveys, including DAS, are presented within **Table 13-9**.
HWDT recommended reviewing van Geel *et al.*, 2022, highlighting that there may be beaked whales (Ziphiidae) and sperm whales (*Physeter macrocephalus*) in the area.	Information provided within van Geel *et al.*, 2022 has been included within Section 13.6 where relevant.
Opportunistic sightings from Whale and Dolphin Conservation (WDC) and HWDT could be used to inform the baseline.	Opportunistic sightings data from HWDT's Whale Track have been used to inform the baseline characterisation. The source is included within **Table 13-8** and referenced within Section 13.6 where relevant.
NatureScot recommended that direct effects of noise be split into disturbance and auditory injury.	The assessment of noise is undertaken separately for disturbance and auditory injury (see Sections 13.8 and 13.9).
NatureScot agreed with the proposed approach to assessment and agreed to scope out impacts due to entanglement (or 'ghost fishing').	Risk of injury from entanglement has been scoped out across construction, O&M and decommissioning and included within **Table 13-7**.
NatureScot highlighted the potential requirement for noise abatement and the use of marine mammal observers (MMOs) on board vessels, following the JNCC protocol.	Embedded mitigation relevant to marine mammal receptors is included within **Table 13-25**, which includes the development of an Outline MMMP (M003). Mitigation measures, including NAS and the following of JNCC protocols, are included within the MMMP (see **Outline MMMP, Volume 3**).

Comment	Response/where this is addressed in the EIAR
Other piling mitigation techniques were discussed, such as soft starts/ramp-ups, to reduce noise exposure.	Mitigation measures for marine mammal receptors, including soft-start and ramp-up procedures are included within the Outline MMMP (see **Outline MMMP, Volume 3**).
The planned approach to underwater noise modelling was agreed with NatureScot; confirmed to be carried out by Subacoustech Environmental Ltd. with an empirical model that is based on noise measurements.	Underwater noise modelling has been carried out by Subacoustech Environmental Ltd (see **Appendix 13.3, Volume 2c**).
The cumulative effects framework (CEF) (NatureScot's preferred approach to cumulative assessment) was confirmed as still being in development for assessing population effects on birds and marine mammals.	In the absence of a finalised CEF, the cumulative effects assessment has been carried out using the Interim Population Consequences of Disturbance (iPCoD) model, which is a component of CEF (see Section 13.13.2).

13.3.3 SCOPING OPINION

13.3.3.1 Spiorad na Mara Limited (hereafter referred to as 'the Applicant') submitted a Scoping Report (Spiorad na Mara Limited, 2023) and request for a Scoping Opinion to the MD-LOT in September 2023. A Scoping Opinion was received in May 2024. The Scoping Report sets out the proposed Marine Mammals assessment methodologies, outline of the baseline data collected to date and proposed, and the scope of the assessment. The comments received in the Scoping Opinion and how these have been addressed in this EIAR is provided in **Appendix 5.2: Response to Scoping Opinion, Volume 1c**.

13.3.3.2 A summary of those responses relevant to Marine Mammals is shown in **Table 13-3**. Regard has also been given to other stakeholder comments that were received in relation to the Scoping Report.

Table 13-3 Scoping Opinion responses – Marine Mammals

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
NatureScot	May 2024 Scoping Opinion	The list of sources should be updated to include Scottish Marine Animal Stranding Scheme (SMASS), British Divers Marine Life Rescue (BDMLR), ORCA ferry surveys, WDC Shorewatch data and Small Cetaceans in European Atlantic Waters and the North Sea (SCANS) IV. It should also include Paxton *et al.,* 2014, Witt *et al.,* 2012, and Speedie and Austin *et al.,* 2019 sources of basking shark data. We also note Carter *et al.,* 2022 is missing from this list, although it is later referred to in seal density figures (ERM, 2023).	The EIA baseline will include a full desktop review, including those mentioned and any more recently available sources (see Section 13.6). SMASS is the dedicated research and reporting scheme for stranded cetaceans and pinnipeds, to which BDMLR submits data; therefore, separate reports of strandings from the BDMLR will be unnecessary. Data from ORCA surveys and WDC Shorewatch will be covered via inclusion of publications making use of these data. Basking sharks are now covered in the Fish Ecology chapter (**Chapter 12, Volume 2a**), thus Witt *et al.* and Speedie and Austin papers will be incorporated there.
NatureScot	May 2024 Scoping Opinion	With regard to SCANS data – in some cases, SCANS III and SCANS IV may not have the same coverage in terms of density estimates for every species of cetacean within or between every survey block. We advise the Applicant to include species densities for every listed species from SCANS IV wherever possible, and if some are missing that are still found in SCANS III – then use the density estimate through from SCANS III wherever needed (or if SCANS III is significantly higher/more precautionary). However, if a higher still density estimate is calculated from site specific DAS, then this should be used over either SCANS III or IV – as this would be the most precautionary approach.	The proposed approach is confirmed. SCANS IV forms the basis of the data, with SCANS III used where coverage is lacking, or were significantly higher. The more precautionary of DAS and SCANS data will be used for the assessment in the EIAR. The density estimates taken through to the assessment are given in **Table 13-23**.
NatureScot	May 2024 Scoping Opinion	UXO Clearance Joint Interim Position Statement should also be listed as a key guidance document.	The interim position paper has now been replaced by the Joint Position Statement and will be included in the EIAR as a guidance document (see **Table 13-8**).
NatureScot	May 2024 Scoping Opinion	We note that the Regional Baselines report (aka Hague *et al.,* 2020) is listed as a reference, however the EIA Scoping Report omits some of the species included in this reference. We advise the list of species that we expect to see assessed in the EIAR should include grey seal, harbour seal, harbour porpoise, white-beaked dolphin, orca, Risso's dolphin, minke whale, common dolphin, bottlenose dolphin, Atlantic white sided dolphin, long finned pilot whale, humpback whale, fin whale and beaked whale species.	The listed species are confirmed as being considered in the EIAR, though it should be noted that available data/the evidence base will vary significantly between species and be lacking for some (see Sections 13.6, 13.8 and 13.9). Those for which quantitative data are limited will be assessed qualitatively.
NatureScot	May 2024 Scoping Opinion	We appreciate that it may not be possible to generate density estimates for every species included in the assessment and hence carry out a quantitative EIA assessment for each species. If this is the case, then we are content with a qualitative assessment for these species, rather than them being scoped out of the EIA.	Where quantitative assessment is not possible, species will be assessed qualitatively, rather than being scoped out based upon a lack of data (see Sections 13.8 and 13.9).
NatureScot	May 2024 Scoping Opinion	Collision with marine mammals and other megafauna should be scoped into assessment for all stages of the development.	Vessel collision is scoped in for all stages of the Offshore Project (see Sections 13.8 and 13.9). Basking shark is considered within **Chapter 12, Volume 2a**.
NatureScot	May 2024 Scoping Opinion	For the EIA assessment, NatureScot advise the applicant to use the UK portion of the Inter Agency Marine Mammal Working Group (IAMMWG) Management Unit (MU). This is the appropriate spatial scale to enable the most realistic	Noted that the UK portion of MUs is considered to be the most appropriate for the assessment.

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
		assessment of animal numbers affected by development in Scottish waters. The MUs for most species are very large areas, and in most cases are too big for a meaningful understanding of impacts to affected populations. Our position is that the UK portion of the MU better reflects the likely size of populations affected by the potential impact pathways.	UK portion of MUs have been defined in Section 13.6.1 and used for assessment in Sections 13.8-13.11.
NatureScot	May 2024 Scoping Opinion	…the list of embedded mitigation measures is minimal at this point. We advise the Applicant to specify the use of MMOs and passive acoustic monitoring (PAM), the Scottish Marine Wildlife Watching Code (SMWWC), and inclusion of consent plans including a Vessel Management Plan (VMP) and a MMMP which should include the circumstances of when and how Acoustic Deterrent Devices (ADDs) will be deployed.	Acknowledged that mitigation measures will be discussed in further detail in the EIAR and supporting documents (see **Table 13-25**).
NatureScot	May 2024 Scoping Opinion	We also advise that, due to recent success of low order deflagration techniques for UXO clearance in the Moray Firth, this is likely to be the preferred method in Scottish waters and we would expect to see this technique as the option for UXO clearance.	Acknowledged that low-order techniques are preferred for UXO clearance. However, since initial consultation, the design envelope no longer includes the assessment of UXO clearance following the initial site investigations. Should any UXO clearance be required following pre-construction surveys, this activity would be consented separately to this Application, and ultimately safely disposed of from the seabed, ensuring safety during installation. Therefore, UXO clearance has not been considered within the EIAR.
NatureScot	May 2024 Scoping Opinion	The Applicant has commissioned a DAS programme of 24 months (beginning in March 2022) for the Array Area and a 10 km buffer. No additional details of the DAS methodology are provided so we cannot provide advice on the suitability of the surveys for the assessment. Data from the first year of DAS results has been incorporated into the EIA Scoping Report. We advise that no potential receptor species should be scoped out based on a single year of data.	It is confirmed that no species were scoped out of the assessment, on the basis of the first year of DAS data. Additionally, the species listed by NatureScot as being expected to be included have been assessed (see Section 13.6).
NatureScot	May 2024 Scoping Opinion	The EIA Scoping Report briefly addresses the proposed approach to Cumulative Effects Assessment in Section 4.4, although does not set out any specific approaches. Therefore, we cannot provide specific advice on their approach to cumulative assessment of impacts on marine mammal and other megafauna receptors. However, we advise that if the CEF is published within project timeframe then it should be used to undertake the cumulative assessment. If it is not published, we still recommend the use of the iPCoD model.	It is acknowledged that the CEF would have been the preferred approach for cumulative assessment. However, it is not yet available, therefore, the iPCoD model has been used on the 5 species for which it is parameterised (see Section 13.13).
NatureScot	May 2024 Scoping Opinion	No specific monitoring for marine mammals and other megafauna is specified in the EIA Scoping Report. Further information on proposed monitoring should be discussed in the EIAR. Spiorad na Mara is the first of the ScotWind sites off the west coast of Scotland/*Alba* to reach EIA Scoping stage. Additionally, there are no operational or consented offshore wind projects on the west and northwest coasts of Scotland/*Alba* and this presents an opportunity for developers to consider strategic work, particularly between the cluster of Spiorad na Mara, Talisk and Havbredey. NatureScot encourage	A PAM campaign has been carried out in order to inform the EIAR (see Section 13.5). This consisted of 2 static PAM moorings at 2 locations within the Array Area to provide additional baseline data on marine mammals.

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
		strategic work between developers in the region, as this kind of approach has been very successful in the Moray Firth and Forth & Tay regions, especially in terms of monitoring cetaceans. Much of our advice on offshore wind farm (OWF) developments off the east coast of Scotland/*Alba* has its origin in monitoring work through collaborations between developers, academic establishments and government agencies.	
NatureScot	May 2024 Scoping Opinion	Drawing from the success of implementing monitoring on the east coast of Scotland, developers on the west have the opportunity to support the monitoring of Risso's dolphin, through photo ID work and understanding connectivity to the North East Lewis Marine Protected Area (MPA). It will become increasingly important to understand the interactions and behaviour of Risso's dolphin, as so little is known about this species. There could also be opportunities to collaborate with the Marine Directorate SPAN network, supporting the monitoring of harbour porpoise in the Inner Hebrides and the Minches Special Area of Conservation (SAC). We would welcome discussion and regular communication between the developer, nature conservation non-governmental organisations (such as HWDT and WDC), academics, Marine Directorate and NatureScot to consider a plan for monitoring cetaceans off the west coast as soon as feasible.	A PAM campaign has been carried out in order to inform the EIAR (see Section 13.5). This consisted of 2 static PAM moorings at 2 locations within the Array Area to provide additional data on marine mammal presence.
NatureScot	May 2024 Scoping Opinion	We welcome the inclusion of assessments considering inter-related effects [cumulative effects] and transboundary effects, as briefly described in EIA Scoping Report (Section 4.5). We advise that transboundary effects on marine mammals and other megafauna can be scoped out of further assessment.	It is acknowledged that transboundary effects on marine mammals and megafauna can be scoped out of further assessment. Therefore, there is no assessment on transboundary effects included in this chapter.
NatureScot	May 2024 Scoping Opinion	We confirm that we are content with the proposed assessment methodology for underwater noise. This includes the use of the INSPIRE model for higher level noise sources such as piling, and the SPEAR model for lower-level noise sources such as dredging. We support the use of Southall *et al.,* 2019 for PTS/ TTS thresholds as well as the application of dose response curves (Graham *et al.,* 2017, 2019 for cetaceans and Whyte *et al.,* 2020 for seals) for disturbance to all species of marine mammal. In terms of noise/ propagation modelling, we highlight the recommendations from the recent ScotMER report on marine piling. The applicant should also consider the recently published work from ORJIP/The Carbon Trust on Reducing Conservatism in Underwater Noise in assessment for Offshore Wind (ReCON). In addition, NatureScot encourage the use of soft start, ramp up and acoustic deterrent devices (ADDs) for piling and advise the applicant to consider and implement the most up-to-date guidelines on minimising the risk of injury to marine mammals.	Agreement with the proposed underwater noise modelling methodology is noted. We confirm the use of the listed papers for noise criteria and application of dose-response curves (see **Table 13-8**), and that the reports on marine piling noise will be considered in the assessment (see Section 13.8.1, 13.8.2, 13.8.3 and 13.8.4). It is acknowledged that the following mitigation techniques are recommended: soft-start, ramp-up, and use of current guidelines. These have all been implemented in the assessment (see Section 13.7.2).
NatureScot	May 2024 Scoping Opinion	We support the approach of defining mitigation measures in relation to the relevant receptor groups (i.e. marine mammals, fish and shellfish) and setting out those measures in the relevant receptor chapters. No specific monitoring for underwater noise is specified in the EIA Scoping Report. Further information on proposed monitoring should be discussed in the EIAR.	As agreed, receptor-group-specific mitigation measures have been outlined in this chapter, the fish ecology chapter (**Chapter 12, Volume 2a**) and benthic and intertidal ecology chapter (**Chapter 11, Volume 2a**) of this EIAR.

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
NatureScot	May 2024 Scoping Opinion	We advise that transboundary impacts on underwater noise can be scoped out of further assessment.	It is acknowledged that transboundary impacts on underwater noise can be scoped out of further assessment. Therefore, there is no assessment on transboundary effects included in this chapter.
NatureScot	May 2024 Scoping Opinion	EIA Scoping Report Section 6.6.6 describes the proposed approach to assessment, and we confirm this is as expected. This section includes reference to the proposed approach to noise modelling which will be based on the INSPIRE/SPEAR models.	Agreement with the proposed methodology is noted. This methodology has been used in the EIAR (see Section 13.6.2.1), and for the noise modelling detailed in **Appendix 13.3, Volume 2c**.
WDC & HWDT	May 2024 Scoping Opinion	Include the long-term ongoing studies in the region undertaken by Hebridean Whale and Dolphin Trust (HWDT, 2018)	This report, dated 2018, and the newer report from 2024 have been included in the baseline (see **Table 13-8**).
WDC & HWDT	May 2024 Scoping Opinion	Undertaking dedicated systematic vessel-based surveys for cetaceans, utilising a combination of passive acoustic and visual surveys across a much wider area and for a more prolonged period of time, would provide more robust baseline data.	The Offshore Project has undertaken 24 months of digital aerial survey along with 12 months of static passive acoustic monitoring at 2 locations within the Array Area to identify marine mammal species within the array and adjacent to it. Data from both studies will be provided in the EIAR along with an extensive range of published data and information as part of the baseline characterisation (see Section 13.6), on which the impact assessment will be based. Undertaking boat-based survey was not feasible for the Offshore Project given the exposed metocean conditions experienced within the Array Area. Substantial wave heights would have restricted vessel activities to generally the summer months only and therefore it was decided that undertaking DAS and static passive acoustic monitoring would provide the most accurate dataset for the site as detailed in Section 13.5.
WDC & HWDT	May 2024 Scoping Opinion	SCANS IV data has not been included in the key datasets and this should be used in the EIA.	Agreed, SCANS IV data which is presented within Gilles *et al.* (2023) will be used as a dataset as detailed in Section 13.5). The SCANS-IV predicted density surfaces presented within Gilles *et al.* (2025) have not been included within this EIAR, as per communications with NatureScot addressed within **Table 13-4**.
WDC & HWDT	May 2024 Scoping Opinion	Disagree with the baseline described in the scoping report in that there is more species with year-round presence within the survey area as per existing evidence referenced	The EIAR will include a broader set of reference sources than included in the Scoping Report to more accurately characterise the sensitivity and biodiversity of the area. The more detailed year-round species have been included and are further laid out in Section 13.5.
WDC & HWDT	May 2024 Scoping Opinion	Details are lacking within the scoping report on embedded mitigation measures to reduce the underwater noise impacts. In addition, a comprehensive dedicated plan for monitoring for sensitive receptor species including cetaceans should be in place, prior to, during and for several years post construction, in order to guide and inform adaptive mitigation and management plans for the development and operation of the site.	Mitigation measures, including those to reduce the impacts of underwater noise on marine mammal receptors are included within Section 13.6.2.1. An Outline MMMP for the Offshore Project has been developed to guide and inform the mitigation and management for the Offshore Project (see **Outline MMMP, Volume 3**).
WDC & HWDT	May 2024 Scoping Opinion	We consider that the implementation of strict noise level limits would be more effective than current mitigation measures utilised in UK waters at reducing the risk to sensitive species such as cetaceans from piling noise.	The approach to consideration of underwater noise in the EIA follows guidance provided through the consultation process with Marine Directorate and NatureScot. We have undertaken a detailed quantitative assessment associated with the activities during construction, operational and decommissioning phases, and if identified that impacts are considered significant then appropriate mitigation will be implemented. This may include monitoring noise levels to validate mitigated noise levels predicted from the assessment. Assessment Sections 13.8-13.13 provide more specific details on proposed mitigation measures.

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
WDC & HWDT	May 2024 Scoping Opinion	Have serious concerns regarding the need for the scoping report to better define the sensitivity of this area, the lack of comprehensive review of the diversity and year-round presence of cetaceans and other megafauna, and the requirement for full consideration of the potential impacts on cetaceans and other vulnerable species and habitats, including European protected sites, and how best to minimise these.	In addition to the site-specific data that has been collected through a collection of 24 months of monthly DAS surveys and 12 months of static passive acoustic mentoring, the EIAR includes a broader set of reference sources than were included in the Scoping Report, to more accurately characterise the sensitivity and biodiversity of the area. The Habitats Regulations Assessment will consider impacts to European protected sites (see Section 13.5).
WDC & HWDT	May 2024 Scoping Opinion	Waters deeper than 200 m, e.g. to the west of northern Scotland are considered important for a variety of cetacean species. Acoustic data from the SAMOSAS array is available and has demonstrated this is important habitat for a range of cetaceans (Van Geel *et al.*, 2022)	Acknowledged. The findings of van Geel *et al.* 2022 (closest moorings within 30 km of the Array Area) have been considered in forming the baseline for the EIAR as detailed in Section 13.6.
WDC & HWDT	May 2024 Scoping Opinion	There is no reference to the strandings records which will help to inform potential habitat use of various species and also diversity of species that are hard to detect from visual surveys alone. Of note is the recent mass stranding incident of pilot whales on the northeast coast of Lewis in July 2023. This significant mass-stranding is not mentioned within the scoping report, neither are the ongoing investigations to establish whether there could be a causal link to anthropogenic activities	Strandings data have been reviewed for this EIAR and the pilot whale mass-stranding event is discussed in the baseline (see Section 13.6.1) along with a potential cause, as per information available at time of writing.
WDC & HWDT	May 2024 Scoping Opinion	Given that the shelf and shelf edge waters to the northwest of the UK are known to be of importance to cetaceans, the lack of previous development in the area, the proximity of the proposed developed site to several MPAs designated for marine mammals, and the potential cumulative and transboundary impacts of the various offshore developments planned (or underway) in the region, further dedicated baseline data collection should be required and reference made to these issues within the scoping report.	In addition to the site-specific data that have been collected through 24 months of DAS surveys and 12 months of static PAM, the EIAR includes a broader set of reference sources than were included in the scoping report, to more accurately characterise the sensitivity and biodiversity of the area (see Section 13.6.1). An assessment of likely significant effects on the conservation objectives of MPAs with marine mammal features within the Study Area is carried out within the relevant species sections of the assessment (see Sections 13.8 and 13.9).
WDC & HWDT	May 2024 Scoping Opinion	We would also like to raise that several of the points we have made in this section, particularly around interpreting existing datasets for the development area which are based on limited effort and highlighting additional useful datasets that should be considered (i.e. WDC data and SAMOSAS array data), were previously raised by HWDT during a stakeholder meeting we attended.	Comments made at a stakeholder event referenced here have now been captured in the early engagement section of this EIAR (see Section 13.3.2) and have been duly noted in the preparation of the marine mammal assessment (see **Table 13-8**).
WDC & HWDT	May 2024 Scoping Opinion	There are several European protected sites (SACs) in the vicinity of the proposed development area which have marine mammals as designated features (see map, page 205). This is important to note, and we would urge that there is a need for a detailed Habitat Regulation Assessment (Appropriate Assessment) in relation to these protected areas due to their close proximity and the potential for propagation of impacts.	This is acknowledged. Screening has subsequently been undertaken for European protected sites that could be affected by the Offshore Project. The following sites have been screened in, with respect to marine mammals: • Inner Hebrides and the Minches SAC (harbour porpoise); • Monach Islands SAC (grey seal). A Report to Inform Appropriate Assessment (RIAA) has been produced to assess Offshore Project impacts on these 2 SACs.
WDC & HWDT	May 2024 Scoping Opinion	It is unclear why collisions with vessels and pollution are scoped out of the EIA scoping assessment table, given that cetaceans are known to be vulnerable to collisions, and vessel traffic will increase in the area in association with the development and operation of the site.	Both collision with vessels and accidental pollution have now been scoped into the EIAR, to be assessed in all phases and is included in the assessment Sections 0 and 13.9).

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
WDC & HWDT	May 2024 Scoping Opinion	The expected risk reduction of any mitigation measures proposed for offshore developments should be quantified as part of the planning and consenting process.	Embedded and additional secondary mitigation has been detailed in the EIAR, with evidence for efficacy discussed, as appropriate (see **Table 13-25**).
Bernera Community Council	May 2024 Scoping Opinion	Councillors noted that the whales information is likewise based on reported tourist sightings rather than true data. The East side/Minch are popular whale spotting areas which is why they report higher numbers of whales and dolphins sightings; the water on the West coast is just as populated with whales and dolphins but goes unreported… Wildlife is an important tourist attraction for Bernera and the West side and therefore the preservation of the local environment is a priority for local industry and residents.	In addition to the site-specific data that have been collected through 24 months of DAS surveys and 12 months of static PAM, the EIAR includes a broader set of reference sources than were included in the Scoping Report, to more accurately characterise the sensitivity and biodiversity of the area (see **Table 13-8**) (see Section 13.6).

13.3.4 HABITAT REGULATIONS APPRAISAL SCREENING OPINION

13.3.4.1 The response to the Habitats Regulations Appraisal (HRA) Screening Report included a comment from NatureScot:

"we advise that the Risso's dolphin feature of North-east Lewis MPA is assessed and considered in the EIA, especially until more is known about noise contours".

13.3.4.2 Further information relating to the North-east Lewis MPA and its conservation objectives is given in Section 13.6.1, as part of the desk study of baseline conditions for Risso's dolphin. A further nature conservation MPA with a marine mammal feature has also been considered: the Sea of the Hebrides MPA, designated for minke whale. This is considered in Section 13.6.1, as part of the desk study of baseline conditions for minke whale.

13.3.4.3 The 2 MPAs are assessed for any potential effects on their respective conservation objectives in Section 13.8 and Section 13.9.

13.3.5 POST SCOPING CONSULTATION

13.3.5.1 Following the receipt of the Scoping Opinion, further consultation relating to Marine Mammals has been held with a number of stakeholders. A summary of this consultation is detailed in **Table 13-4**.

Table 13-4 Summary of post scoping consultation

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
NatureScot	October 2024 Email	The Applicant contacted NatureScot for advice on undertaking the assessment of noise and the use of iPCoD, while the CEF remains unavailable. – NatureScot advised that the Applicant "*use the modelling/assessment against the reference population approach for all species, and then also use iPCoD for the five species it is available for. The first one will give a consistent assessment across all species for a snapshot in time, and the second will provide additional predictions of long-term changes to the key species. You may be able to justify not doing iPCoD for harbour seal, if the site-specific data and the Carter maps indicate low abundances of this species. However, we would recommend doing iPCoD for the remaining four species*". ……… "*We advise only Scottish projects within the MUs are included, with a year on either side of the project development. Where underwater noise contours are not available from other projects, we can accept the use of EDRs*".	A quantitative assessment, based upon underwater noise modelling has been carried out for all species where sufficient density data are available, with iPCoD having been carried out for the 5 species for which it is available. The assessments for both the Project alone and cumulative have been carried out using projects within the UK portions of the relevant MUs only.
NatureScot	April 2025 Email	Prior to undertaking iPCoD, the Applicant confirmed the interpretation of wording from the previous advice received from	The wording, 'a year on either side' was confirmed as meaning:

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
		NatureScot in October 2024 (above): *"We advise only Scottish projects within the MUs are included, with a year on either side of the project development."*	1. *"In terms of the list of projects to scope into the assessment, it should be a year on either side, only when the project is being constructed…* 2. *However, when it comes to what parameters to feed into iPCoD – it should begin at the start of when the scoped in projects began piling, not just when the noise directly overlaps with the project being assessed…"*
WDC & HWDT	May 2025 Email	The Applicant contacted HWDT & WDC with regard to their joint response to the Offshore Project's Scoping Report and provided initial responses for consideration by both organisations. No further queries were received from WDC & HDWT.	A finalised set of responses to comments from WDC & HWDT on the Scoping Report can be found in **Table 13-3**.
NatureScot	June 2025 Email	The Applicant contacted NatureScot regarding the publication of 2 new fine-scale density datasets for marine mammals. The first was a peer-reviewed paper (Gilles *et al.*, 2025) released in May 2025, with accompanying GIS shapefiles of surface density estimates for cetaceans, based on the SCANS-IV surveys. The paper is the equivalent of the Lacey *et al.* 2022 paper produced with SCANS-III survey data.	Modelled density surfaces for cetaceans are, therefore, carried forward into the assessment from the Lacey *et al.*, 2022 paper based upon SCANS-III, to be used where fine-scale density estimates are more appropriate (i.e. assessment of disturbance from piling noise). SCANS-IV data were also carried forwards into the assessment, but as uniform density estimates published by Gilles *et al.*, 2023.

Consultee	Date/Document	Comment	Response/where this is addressed in the EIAR
		The second was the accompanying GIS shapefiles, released in June 2025, for a Marine Scotland publication published earlier in the year for harbour and grey seal modelled distribution (Carter *et al.*, 2025). These mapping files are the equivalent of those provided with the Carter *et al.*, 2022 paper. NatureScot advised that there was no requirement to redo the assessments with the new data, if they had already been completed based on previously available data.	Modelled distribution of harbour and grey seals are, therefore, carried forward into the assessment from Carter *et al.* 2022, where fine-scale density estimates are more appropriate for use (i.e. assessment of disturbance from piling noise).

13.4 SCOPE OF THE ASSESSMENT

13.4.1 OVERVIEW

13.4.1.1 This section sets out the scope of the EIA assessment for Marine Mammals. This scope has been developed as the Offshore Project design has evolved and responds to feedback received to date as set out in Section 13.3.

13.4.2 SPATIAL SCOPE AND STUDY AREA

13.4.2.1 The spatial scope of the marine mammal assessment is defined by 2 types of zones of influence (ZOIs), in order to provide a proportionate assessment:

- Impact pathways with more localised effects, such as disturbance from vessels or pollution events, have a smaller ZOI, and are considered within the 'marine mammal Study Area';
- Wider ranging noise impact pathways are assessed using species-specific management units and seal monitoring units, as described below.

Marine mammal Study Area

13.4.2.2 The marine mammal Study Area is composed of the Array Area plus Offshore Cable Area of Search (OCAS) plus a 100 km buffer (**Figure 13.1, Volume 2b**). The 100 km buffer is based on the maximum foraging ranges of grey seals from haul-out sites (SCOS, 2021) and is also considered suitable for assessment of cetaceans using the area near to the site. The Study Area incorporates the coastal waters surrounding the northern part of Isle of Lewis/*Eilean Leòdhais* and the body of water between the Isle and the Scottish mainland, some 35 km to the east and south, known as The Minch/*Mhaoil*. Deepest waters out towards the continental shelf cross the 1,000 m contour, but most of the Study Area waters are between 50 m and 200 m in depth.

Species-specific ZOIs

13.4.2.3 On the basis that almost all cetacean species in UK waters form part of larger biological populations across other territories, it is important to consider them in smaller sub-groups (IAMMWG, 2015). In 2015, the Inter-Agency Marine Mammals Working Group (IAMMWG) defined a set of 'management units' (MUs) for the most common cetacean species. An MU is a geographical area in which a cetacean population is found, to which management of human activities is applied (IAMMWG, 2023). MUs therefore take into account the best understanding of population ecology, as well as political boundaries and other divisions relating to, for example, fisheries management. Given their large size, the UK portion of MUs represent appropriate spatial scales in which impacts of marine developments can be assessed, as recommended by NatureScot (Section 13.3; **Table 13-4**).

13.4.2.4 For seals, geographical regions are referred to as seal monitoring units (SMUs). SMUs are regional groups of regularly monitored grey seal and harbour seal colonies. The Special Committee on Seals (SCOS) provides scientific advice and population estimates for both species of seal found in UK waters in a series of reports (SCOS, 2023).

13.4.2.5 For all marine mammals, underwater noise from pile driving represents the impact pathway with the largest ZOI. The assessment of underwater noise impacts has, therefore, been undertaken at a spatial scale defined by underwater noise modelling, conducted by Subacoustech Environmental Ltd (see **Appendix 13.3, Volume 2c**), with auditory injury ranges calculated in relation to the UK portions of all relevant MUs and SMUs, as shown in **Figure 13.1, Volume 2b** and as agreed with NatureScot (**Table 13-4**). MUs and SMUs relevant to the assessment are detailed in Section 13.6.

13.4.3 TEMPORAL SCOPE

13.4.3.1 The temporal scope of the assessment of marine mammals is the entire lifetime of the Offshore Project, which therefore covers the construction, O&M and decommissioning phases. The projected time frame of the Offshore Project is a 5-year construction period anticipated for offshore infrastructure, with work programmed within the Turbine Area between April and October to allow for optimal weather conditions. Construction is anticipated to commence in 2028/2029 with an estimated completion in 2032/2033, with working hours expected to be 24 hours, 7 days a week during the construction period. It will have an anticipated operational phase of up to 35 years, through to decommissioning in the year 2068. However, the cumulative assessment also considers the phasing of other projects (see Section 13.13).

13.4.4 POTENTIAL RECEPTORS

13.4.4.1 The spatial and temporal scope of the assessment enables the identification of receptors which may experience a change as a result of the Offshore Project. Receptors with the potential to experience likely significant effects were identified in the EIA Scoping phase, based on the most recent publicly available data, supplemented by site-specific DAS and PAM. Receptors are listed in **Table 13-5**, as agreed in consultation with NatureScot (**Table 13-3**). Important ecological features (IEF)[1] contained within these receptor groups and taken forward to the assessment are identified and presented in the baseline conditions, see Section 13.6.

Table 13-5 Receptors requiring assessment for Marine Mammals

Receptor Group	Receptors included within group
Cetaceans: Odontocetes (toothed whales)	Harbour porpoise *Phocoena phocoena* White-beaked dolphin *Lagenorhynchus albirostris* Common dolphin *Delphinus delphis* Bottlenose dolphin *Tursiops truncatus* Risso's dolphin *Grampus griseus* Atlantic white-sided dolphin *Lagenorhynchus acutus* Long-finned pilot whale *Globicephala melas* Killer whale *Orcinus orca* Beaked whale species Ziphiidae
Cetaceans: Mysticetes (baleen whales)	Minke whale *Balaenoptera acutorostrata* Humpback whale *Megaptera novaeangliae* Fin whale *Balaenoptera physalus*
Pinnipeds (seals and relatives)	Grey seal *Halichoerus grypus* Harbour seal *Phoca vitulina*
MPAs	North-east Lewis (protected feature: Risso's dolphin) Sea of the Hebrides (protected feature: minke whale)

13.4.5 ACTIVITIES OR IMPACTS SCOPED INTO ASSESSMENT

13.4.5.1 Potential impacts on marine mammal receptors that have been scoped in for assessment are summarised in **Table 13-6**. In addition to those activities and impacts listed in the Scoping Report, accidental release of pollutants and collision with vessels have been scoped in across all phases, as per the advice from MD-SEDD in the Scoping Opinion (see **Table 13-3**). Noise impacts have been separated into auditory injury and disturbance, as per advice from NatureScot in early engagement (see Section 13.3.2).

[1] Components of an ecosystem that are vital to its function and biodiversity. Such as, habitats, species, or processes.

13.4.5.2 For the purposes of this Marine Mammal chapter, the terms ‘piling’ and ‘pile-driving’ are used to denote percussive or impact piling, rather than the installation of piles via the drill-and-grout method.

13.4.5.1 Although UXO clearance was originally scoped into the assessment, the current design envelope no longer includes UXO clearance activities. Therefore, potential impacts of UXO clearance on marine mammals are not considered further in this EIAR.

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Table 13-6 Activities or impacts scoped into the assessment for Marine Mammals

Receptor	Activity or Impact	Potential effect
Construction		
Harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale, beaked whale species, minke whale, humpback whale, fin whale, grey seal, and harbour seal North-east Lewis and Sea of the Hebrides MPAs	Auditory injury from piling noise	Auditory injury may occur as a result of underwater noise generated during piling activity. Marine mammals are particularly sensitive to underwater noise and use sound for communication, foraging, predator detection, and navigation.
	Disturbance from piling noise	Disturbance and behavioural effects may occur as a result of underwater noise generated during piling activity. Marine mammals are particularly sensitive to underwater noise and use sound for communication, foraging, predator detection, and navigation.
	Auditory injury from other construction noise	Construction activities other than piling associated with the Offshore Project, such as cable laying and vessel movements, will produce underwater noise, which may cause auditory injury of marine mammal receptors.
	Disturbance from other construction noise	Construction activities other than piling associated with the Offshore Project, such as works within the HDD Exit Pit Area, cable laying and vessel movements, will produce underwater noise, which may result in disturbance, avoidance, or other behavioural changes in marine mammal receptors.
	Vessel collision	Marine mammal receptors, particularly large, slow-moving whales, are susceptible to ship strikes, which can result in permanent injury or mortality.
	Disturbance or temporary habitat loss from presence of vessels	The temporary loss of habitat or disturbance of marine mammal receptors may occur as a result of increased infrastructure and vessel presence in the area.
	Accidental release of pollutants	Accidental pollutant spills from equipment associated with the construction phase may impact marine mammal receptors through direct injury as a result of prolonged exposure to chemical pollutants in the marine environment,

Receptor	Activity or Impact	Potential effect
		and indirectly though ingestion of contaminated prey species and habitat degradation.
	Increases in suspended sediment concentration and reduction in water quality	A reduction in water quality or increase in suspended sediments in the water column as a result of construction activities may affect marine mammal health or foraging success.
	Indirect effects of impacts on prey availability	Changes in prey availability caused by construction activities associated with the Offshore Project may result in impacts to marine mammal receptors by increasing energetic expenditure in foraging.
Operation and maintenance		
Harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale, beaked whale species, minke whale, humpback whale, fin whale, grey seal, and harbour seal North-east Lewis and Sea of the Hebrides MPAs	Disturbance from turbine noise	During operation, there is potential for disturbance, displacement, and/or modifications of behaviour as a result of underwater noise produced by turbines.
	Disturbance from other operational noise	O&M activities associated with the Offshore Project, such as vessel movements and cable repairs, will produce underwater noise, which may result in disturbance, avoidance, or other alterations of behaviour in marine mammal receptors.
	Vessel collision	Marine mammal receptors, particularly large, slow-moving whales, are susceptible to ship strikes, which can result in permanent injury or mortality.
	Barrier effects	Infrastructure associated with the Offshore Project has the potential to cause barrier effects, which could disrupt the passage of marine mammal receptors.
	Long-term changes in habitat and foraging opportunities	Infrastructure associated with the Offshore Project, noise from maintenance activities and underwater noise from turbine operation and vibrations can displace marine mammal receptors and can reduce foraging opportunities.
	Accidental release of pollutants	Accidental pollutant spills from equipment associated with O&M may affect marine mammal receptors through direct injury as a result of prolonged

Receptor	Activity or Impact	Potential effect
		exposure to chemical pollutants in the marine environment, and indirectly though ingestion of contaminated prey species and habitat degradation.
	Increases in suspended sediment concentration and reduction in water quality	A reduction in water quality or increase in suspended sediments in the water column because of O&M activities may affect marine mammal health or foraging success.
	Indirect effects of impacts on prey availability	Changes in prey availability caused by maintenance/repair activities associated with the Offshore Project may result in impacts to marine mammal receptors by increasing energetic expenditure in foraging.
Decommissioning		
Harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale, beaked whale species, minke whale, humpback whale, fin whale, grey seal, and harbour seal North-east Lewis and Sea of the Hebrides MPAs	All activities	During the decommissioning phase of the Offshore Project, activities which may affect marine mammal receptors are expected to be of equivalent or lesser impact than those included for the construction phase. Further information is given in Section 0.

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13.4.6 ACTIVITIES OR IMPACTS SCOPED OUT OF ASSESSMENT

13.4.6.1 A number of potential impacts have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment, the nature of planned works and the wealth of evidence on the potential for impact from such projects more widely. The conclusions follow (in a site-based context) existing best practice. Each scoped out activity or impact is considered in turn in **Table 13-7**.

Table 13-7 Activities or impacts scoped out of assessment

Activity or impact	**Rationale for scoping out**
Auditory injury or disturbance from geophysical surveys	Geophysical surveys are not within the design envelope and noise impacts associated with the approach are therefore scoped out of the assessment.
Risk of injury from entanglement with construction vessel mooring lines, or discarded fishing gear (construction, O&M, and decommissioning)	Mooring lines associated with construction, O&M and decommissioning vessel activity have the potential to pose an entanglement risk for marine mammal receptors. However, any vessel moorings during the construction phase will be temporary, and mooring lines will be maintained taught with no ability to form loops. Likewise, any mooring lines are unlikely to collect ghost fishing gear as they will be temporary. Marine mammals are likely to avoid interaction with any vessels or mooring lines due to disturbance effects from vessels during works. All wind turbine generators (WTGs) will be fixed base and there will be no mooring lines associated with WTGs. The effect is therefore scoped out, as agreed by NatureScot in the Scoping Opinion.
Electromagnetic fields (EMFs) associated with subsea cables	There is a paucity of research into the abilities of marine mammals to detect electrical or magnetic fields, with the only evidence being in the response of some cetaceans to the Earth's magnetic field, with the suggestion that this to guide long-distance migration (see review by Normandeau *et al.*, 2011). Given the localised nature of any cable effects, EMF as a direct effect on marine mammals has been scoped out, as agreed by NatureScot in the Scoping Opinion. Secondary effects to prey species will be captured within indirect effects of impacts on prey availability.
Transboundary effects	Marine mammals are highly mobile and wide ranging, and some have distributions which overlap multiple jurisdictions. The Offshore Project is located off the northwest coast of the Isle of Lewis/*Eilean Leòdhais*, which is approximately 260 km away from the UK and Republic of Ireland Median Line. MUs for marine mammals demonstrate that species have ranges

Activity or impact	Rationale for scoping out
	which extend into international waters, including travelling between UK and Irish waters. Transboundary effects have however been scoped out of further assessment, as agreed with NatureScot in the Scoping Opinion, due to the large distances between the Offshore Project and other jurisdictions, and the unlikely occurrence of transboundary effects relating to the Offshore Project on marine mammal receptors.

13.5 METHODOLOGY FOR BASELINE DATA GATHERING AND IMPACT ASSESSMENT

13.5.1 METHODOLOGY FOR BASELINE DATA GATHERING

Overview

13.5.1.1 Baseline data collection has been undertaken to obtain information over the Study Area described in Section 13.4. The current baseline conditions presented in Section 13.6 set out data currently available from the Study Area.

Desk study

13.5.1.2 The data sources that have been collected and used to inform this Marine Mammal assessment are summarised in **Table 13-8**.

Table 13-8 Data sources used to inform the Marine Mammals EIA

Source	Date Accessed	Summary	Coverage of Study Area
Hebridean Whale and Dolphin Trust (HWDT), 2024	June 2025	The HWDT's Whale Track sightings map showcasing records of cetacean sightings uploaded by citizen scientists across the west coast of Scotland/*Alba* via a bespoke app.	Full coverage of the Study Area
Natural England, 2024	June 2025	Multi-Agency Geographic Information for the Countryside (MAGIC) is an online interactive mapping tool providing government-supplied geographical and ecological data. Marine statutory designations are available on MAGIC, including SACs for marine mammals, and distance to the Offshore Project can be calculated using the measurement tool.	Full coverage of the Study Area
Scottish Marine Animal Stranding Scheme (SMASS), 2024	June 2025	The SMASS website displays the cetacean, seal, turtle and shark strandings reported in Scottish waters on an interactive map. Mapped strandings date back to 1989.	Full coverage of the Study Area
ORCA, 2024	June 2025	The latest ORCA annual report presents survey information carried out on board vessels of opportunity between Ullapool/*Ulapul* and Stornoway/*Steòrnabhagh*, Uig/*Ùige* and Tarbert/*Tairbeart*, and Uig/*Ùige* and Lochboisdale/*Loch Baghasdail*, in 2023.	Partial coverage (50%) of the Study Area
Gilles *et al.*, 2023	June 2025	Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. SCANS-IV surveys were carried out in summer 2022, in succession of previous surveys (SCANS 1994, SCANS-II/ Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA) 2005/2007, SCANS-III 2016). These	Full coverage of the Study Area

Source	Date Accessed	Summary	Coverage of Study Area
		surveys provide long-term information on changes in the abundance and distribution of the most abundant cetacean species.	
IAMMWG, 2023	June 2025	The updated IAMMWG defined marine mammal MUs for the 7 most common cetacean species found in UK waters.	Full coverage of the Study Area
Special Committee on Seals (SCOS), 2022; 2023	June 2025	Scientific Advice on Matters Related to the Management of Seal Populations. Formal advice is given annually based on the latest scientific information provided to SCOS by the Sea Mammal Research Unit (SMRU) at the University of St. Andrews.	Full coverage of the Study Area
Lacey *et al.*, 2022	June 2025	Modelled density surfaces of cetaceans in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. This report describes the density surface modelling for those cetacean species for which sufficient data were obtained during SCANS-III surveys.	Full coverage of the Study Area
Carter *et al.,* 2020; 2022	June 2025	Habitat-based predictions of at-sea distribution for grey and harbour seals in the British Isles.	Full coverage of the Study Area
Hammond *et al.*, 2021	June 2025	Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys.	Full coverage of the Study Area
Hague *et al.*, 2020	June 2025	Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. This report collates and provides up-to-date information on the abundance and distribution of marine mammal species in the Scottish Northern North Sea region and Scottish Atlantic waters and highlights any gaps in current knowledge.	Full coverage of the Study Area

Source	Date Accessed	Summary	Coverage of Study Area
Brownlow *et al.*, 2024; SMASS, 2023; 2022; Davidson and ten Doeschate, 2021; Davidson *et al.*, 2020; Brownlow *et al.*,2019; 2018; 2017; 2016; 2015	June 2025	Scottish Marine Animal Stranding Scheme Annual Reports. These reports analyse and report on data for all cetacean, seal, basking shark and marine turtle strandings across the Scottish coast.	Full coverage of the Study Area
Hebridean Whale and Dolphin Trust, 2018	June 2025	The Hebridean Whale and Dolphin Trust's Marine Mammal Atlas presents an overview of visual sightings data collected from their long-term marine mammal monitoring programme from 2003-2017, on board their research vessel, Silurian.	Full coverage of the Study Area
Russell *et al.*, 2017	June 2025	The estimated at-sea distribution of grey and harbour seals shown as a proportion of total populations from data collected between 1991-2016.	Full coverage of the Study Area
Paxton *et al.*, 2014; 2016	June 2025	Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources. Estimates of spatiotemporal patterns of abundance for seven species of cetacean over a 17-year period from 1994-2010.	Full coverage of the Study Area
Royal Haskoning, 2012	June 2025	Environmental Statement for the Lewis Wave Array (Oyster 2), located within 5 km of the Array Area. Contains a detailed marine mammal baseline for the region. Site-specific surveys for marine mammals were undertaken between September 2010 and September 2011.	Full coverage of the Study Area
Reid *et al.*, 2003	June 2025	Atlas of cetacean distribution in northwest European waters.	Full coverage of the Study Area

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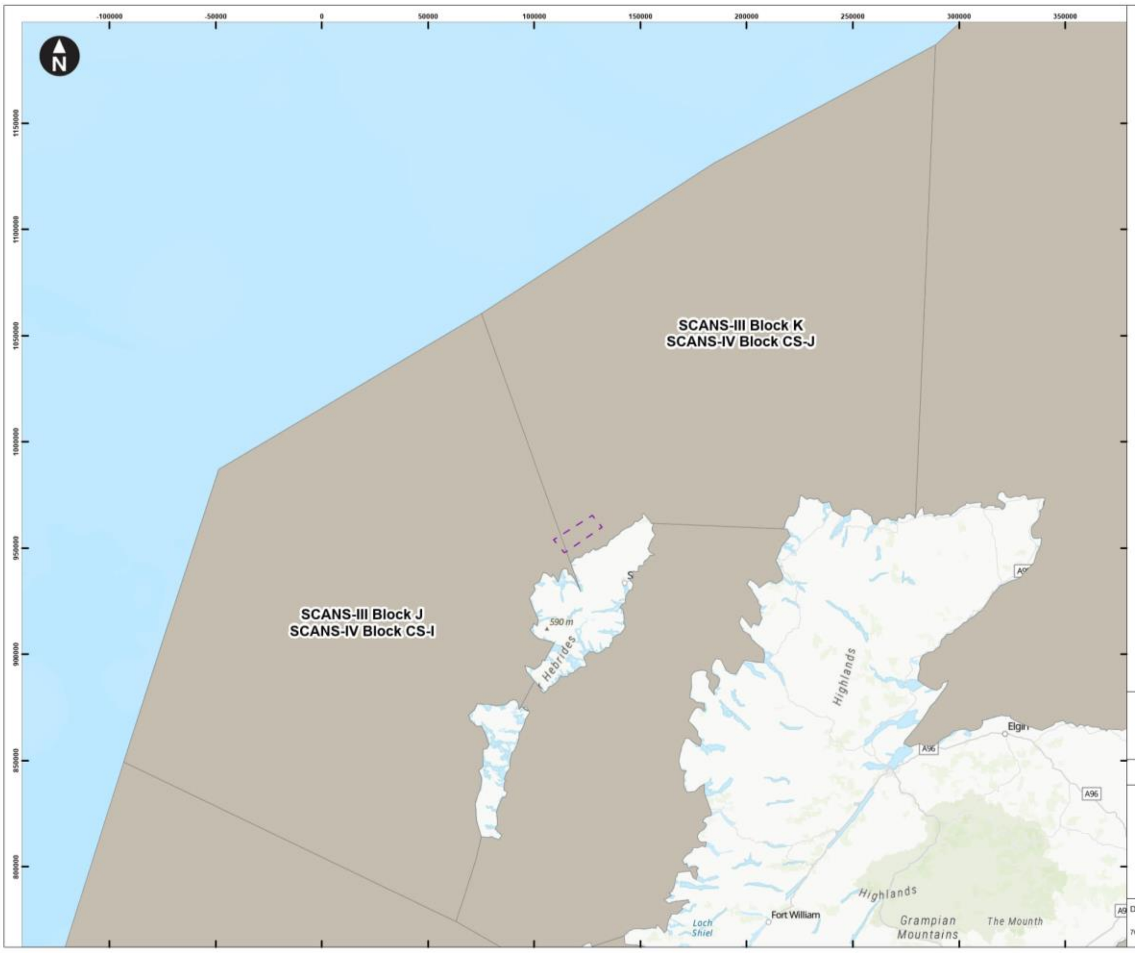
Small Cetaceans in European Atlantic Waters and the North Sea (SCANS)

13.5.1.3 The SCANS surveys are a key data source for cetaceans used in completing the baseline characterisation (see Section 13.6.1), with abundance and density information from the last 2 SCANS surveys and associated publications (Hammond *et al.*, 2021; Lacey *et al.*, 2022; Gilles *et al.*, 2023) being used to inform the impact assessment (see Sections 13.8 and 13.9). The SCANS surveys divide the total area to be surveyed into blocks that are given a letter or combination of letters as an identifier.

13.5.1.4 Abundances and densities for the blocks into which the Array Area and/or OCAS fall have been included in the baseline. These are SCANS-III Block J, renamed to Block CS-I in SCANS-IV, to the southwest of the Array Area, and SCANS-III Block K, renamed to Block CS-J in SCANS-IV, to the north and east of the Array Area (as shown in **Plate 13-1**).

Plate 13-1 Map showing the SCANS blocks (grey) in relation to the Array Area (dashed purple polygon), with the two blocks into which the Array Area and /or OCAS fall identified for SCANS-III (2016) and SCANS-IV (2022)



Special Committee on Seals (SCOS)

13.5.1.5 SCOS produces a series of reports that are a key data source for seals used in the baseline characterisation, providing seal population estimates and at-sea densities in the marine mammal Study Area. Recent reports from SCOS provide count data within SMUs and SACs, and seal telemetry and at-sea distribution data (Carter *et al.*, 2020, 2022; SCOS, 2023, 2022).

Site Surveys

13.5.1.6 The surveys that have been undertaken and used to inform this Marine Mammal assessment are summarised in **Table 13-9**.

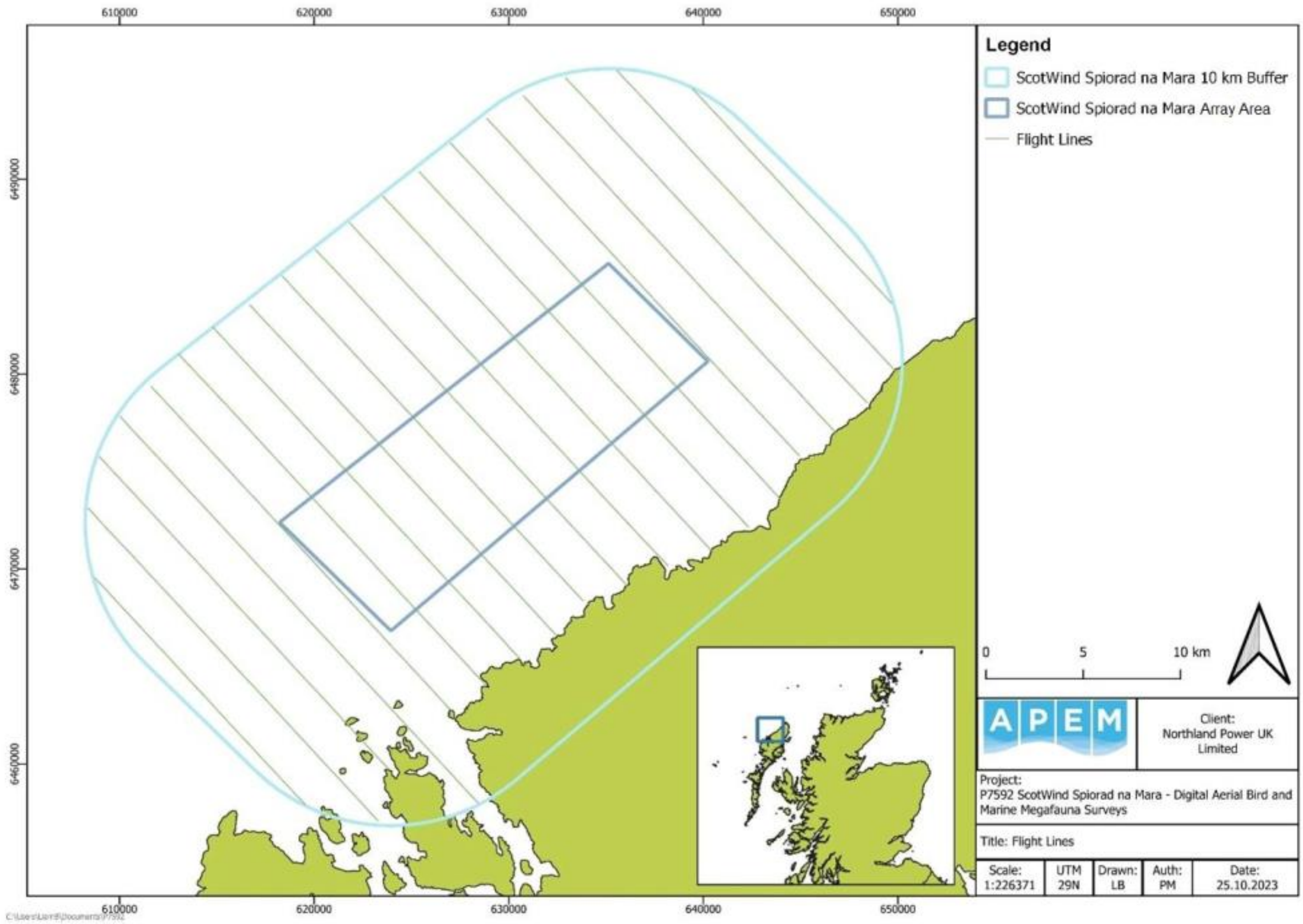
Table 13-9 Site surveys undertaken

Survey type	Scope of survey	Coverage of Study Area
Digital Aerial Bird and Marine Megafauna Surveys: Year 2 Final Report – March 2022-February 2024 (**Appendix 13.1, Volume 2c**).	A suite of 24 monthly surveys to collect baseline data on seabirds, marine mammals and other megafauna.	Full coverage of the Array Area and 10 km buffer. Partial coverage of Marine Mammal Study Area.
Cetacean Presence and Ambient Sound at the Proposed Spiorad na Mara Offshore Wind Development Site (**Appendix 13.2, Volume 2c**).	A 12-month PAM campaign to collect additional baseline data on marine mammals.	Partial coverage of the Array Area and Marine Mammal Study Area.

Digital Aerial Bird and Marine Megafauna Surveys

13.5.1.7 APEM undertook high-resolution still image DAS on behalf of the Applicant to inform the baseline characterisation for seabirds, marine mammals and other megafauna (**Appendix 13.1, Volume 2c**). Surveys were carried out within the Array Area (161 km^2) and a 10 km buffer (779 km^2), referred to collectively as the survey area (940 km^2). Monthly surveys were conducted from March 2022-March 2024 across 2 survey periods. **Plate 13-2** shows the flight lines of the digital aerial still imagery of the Array Area plus a 10 km buffer.

Plate 13-2 Flight lines of the digital aerial still imagery of the Array Area plus a 10 km buffer, reproduced from Appendix 13.1, Volume 2c.



13.5.1.8 The survey method was designed to optimise data collection for seabirds and marine mammals and was carried out using APEM's bespoke digital still camera system which was fitted into a twin-engine aircraft. The survey design used 2.2 km spaced flight lines to capture approximately 30% coverage of the sea surface, of which 10% was analysed in a grid-based survey design. The survey was flown at approximately 1,300 ft (396 m) and captured a ground sampling distance (GSD) of 1.5 cm. During the surveys, the camera system captured still imagery along 19 survey lines at a speed of approximately 120 knots.

13.5.1.9 Post-survey, the raw data were checked to ensure that images were geographically accurate and of high quality. Images were viewed by a minimum of 2 image analysts and went through APEM's internal quality assurance process. The images were analysed to identify marine mammals to species level, where possible, and targets identified in imagery were geo-located. When not possible to identify an individual to species level, it was assigned to a higher-level species group, for example 'seal species' or 'dolphin species'. In total, 27 'unidentified seal species', 2 'unidentified dolphin species', 15 'unidentified dolphin/porpoise', and 3 'unidentified marine mammal species' were recorded within the survey area across all survey months. Following analysis and quality assurance of imagery, raw counts and design-based population estimates were calculated, noting that deceased individuals were excluded. Raw count figures were divided by the number of images collected to give the mean number of animals per image, and population estimates were subsequently generated by multiplying the mean number of animals per image by the total number of images required to cover the Survey Area.

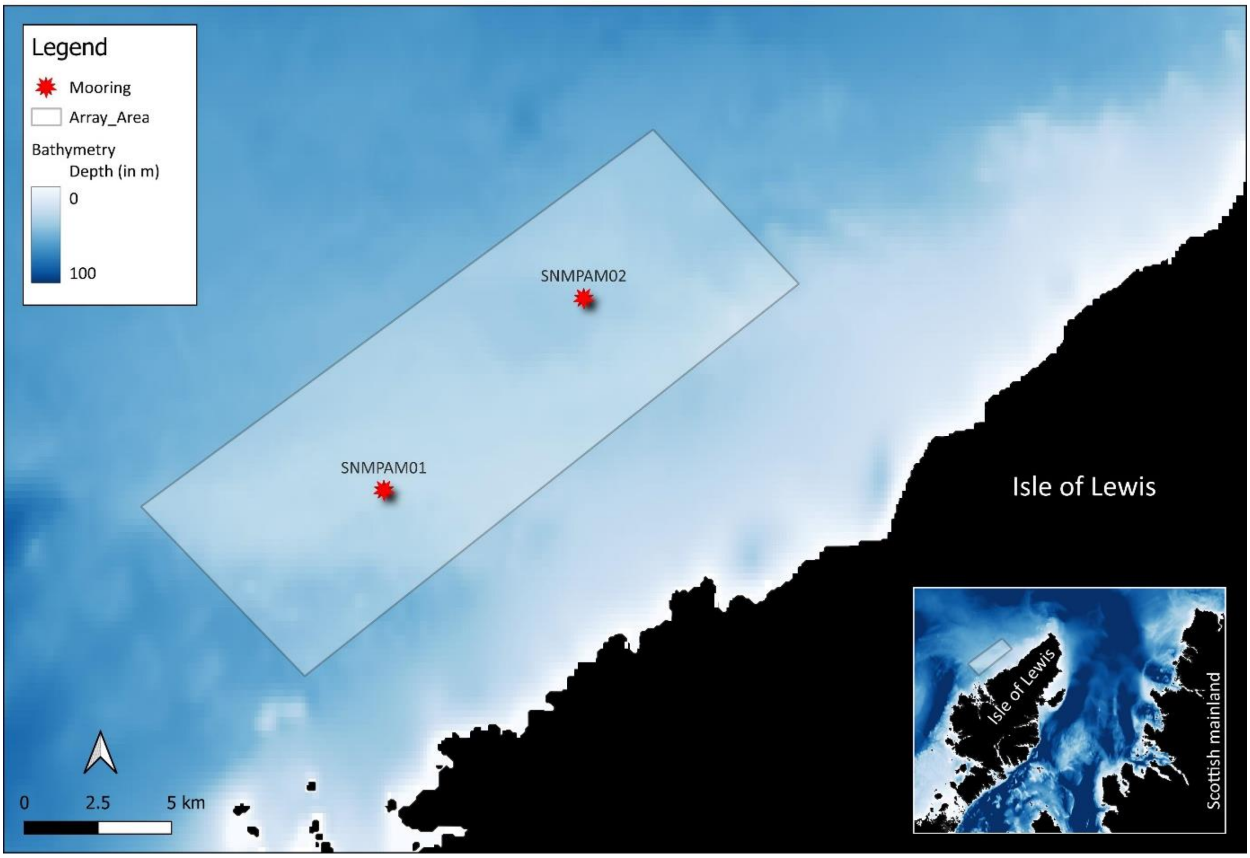
13.5.1.10 Statistical analysis and data manipulation were conducted in the R programming language (R Development Core Team, 2024) to give species-specific monthly abundance estimates with upper and lower confidence limits, using the methods described in **Appendix 13.1, Volume 2c**. In summary, a variability statistic was generated for 999 bootstrap samples and upper and lower 95% confidence intervals (CI). A measure of precision was calculated using a Poisson estimator to produce a coefficient of variation (CV). Low sightings rates were included; thus lower confidence can be expected with a low number of individuals. Dividing the monthly abundance estimates by the size of the area covered (Survey Area, Array Area, or Buffer) calculated the associated density (e.g. animals per km^2) for any given species. Estimates were 'clipped' to the Survey Area, so that observations made outside the area were excluded from the calculations.

13.5.1.11 A full account of DAS data collection, analysis techniques and results are presented in **Appendix 13.1, Volume 2c**.

Cetacean Presence and Ambient Sound at the Proposed Spiorad na Mara Offshore Wind Development Site

13.5.1.12 SAMS Enterprise were contracted by the Applicant to undertake 12 months of PAM (**Appendix 13.2, Volume 2c**), to add marine mammal baseline data of a high temporal resolution in the vicinity of the Offshore Project (**Appendix 13.2, Volume 2c**). The main aim was to deploy 2 PAM moorings to collect and analyse a full calendar year of data on cetaceans, including seasonal occurrence and diurnal activity patterns, and on ambient sound levels. The location of the 2 PAM moorings are presented within **Plate 13-3**.

Plate 13-3 Distance between monitoring locations of the 2 PAM moorings – SNMPAM01 is the Site 1 (SW) mooring and SNMPAM02 is the Site 2 (NE) mooring, which are approximately 9.4 km apart. Reproduced from Appendix 13.2, Volume 2c.



13.5.1.13 All data collection was undertaken between 11 January 2024-9 February 2025. Deployment 1 of PAM equipment captured data between 11 January-11 May 2024, a period that overlapped with the final 2 DAS efforts on 14 February-3 March 2024. Deployment 2 was from 11 May-1 September 2024 and Deployment 3 was from 1 September 2024-9 February 2025.

13.5.1.14 For Deployment 1, a single static PAM mooring was deployed in the southwestern half of the Array Area (hereafter referred to as 'Site 1 (SW)'). During Deployments 2 and 3, an additional mooring was used within the northeastern half of the Array Area (hereafter referred to as 'Site 2 (NE)'). Each mooring was equipped with a long-term broadband acoustic recording unit (ARU) and a high frequency click detector. ARUs used at Site 1 (SW) were SoundTrap ST500STD or ST300HF broadband recorders (Ocean Instruments, New Zealand) and those at Site 2 (NE) were Sylence-LP-400 recorders (RTSYS, France). Click detectors were C-PODS, with F-PODs (both Chelonia Ltd., UK) deployed alongside them with a delayed start time on Deployment 3, to cover the longer recording period.

13.5.1.15 ARUs and click detectors were positioned 5-7 m above the seabed. Each mooring was fitted with an acoustic release system (Innovasea, Canada; RS Aqua, UK) to allow retrieval of instruments without taking up the full mooring system. Acoustic data were recorded continuously on ARUs. SoundTraps had a sampling rate of 96 kHz and a bit depth of 16, while Sylence recorders had a sampling rate of

128 kHz and a bit depth of 16. The combination of devices captured both broadband and click-based sounds, including those made by marine mammals. After recovery, all data were quality checked and securely stored for further analysis.

13.5.1.16 C-POD/F-POD devices were used to detect the presence of harbour porpoises *Phocoena phocoena* by logging their clicks, rather than recording full audio. These detections were processed using specialist software to identify click patterns specific to porpoises, applying high- and moderate-quality filters. The data were summarised by showing how often porpoises were detected each week, based on the percentage of days with confirmed presence, and by measuring Porpoise Positive Minutes (PPM), the number of minutes in which porpoises were detected, per hour. To ensure accuracy, only hours where the device recorded over 90% of the time were included. Some recordings were excluded during periods of high underwater noise, such as during bad weather, which can overwhelm the device's detection limits.

13.5.1.17 To detect delphinids (dolphins and relatives) and their activity, underwater recordings were analysed using PAMGuard software, to identify echolocation clicks and whistles (Gillespie *et al.*, 2008). Initially, the presence of delphinids (not identified to species) was detected and manually checked, with results summarised weekly as the percentage of days they were heard. For species-level identification, an advanced classifier specific to Northeast Atlantic delphinids (updated January 2025) was used. This tool analysed both clicks and whistles, and only high-confidence identifications were included, following strict quality thresholds.

13.5.1.18 Minke whales *Balaenoptera acutorostrata* produce distinctive and well-studied, low-frequency (LF) songs (Mellinger *et al.*, 2000; Risch *et al.*, 2013). To detect them, all recordings were analysed using a machine-learning detector developed specifically for minke whale song (Mouy *et al.*, 2024). The automated results were manually checked for accuracy, and detections were summarised as the percentage of days each week when minke whales were heard, adjusted to account for the amount of recording time available each week.

13.5.1.19 Humpback whale *Megaptera novaeangliae* vocalisations were identified with a humpback whale song detector, which is based on a trained convolutional neural network[2] (Kather *et al.*, 2024). The detector was applied to all available data to identify daily presence of stereotyped humpback whale song (Payne and McVay, 1971). Effort-corrected results were summarised on a weekly resolution.

13.5.1.20 A full account of PAM data collection, analysis techniques and results are presented in **Appendix 13.2, Volume 2c**.

[2] A deep learning algorithm for object recognition and classification.

13.5.2 DATA LIMITATIONS AND ASSUMPTIONS

13.5.2.1 Data limitations relating to marine mammals are presented within **Table 13-10**. These are general limitations that apply whenever DAS and PAM surveys are carried out, rather than being solely applicable to the Offshore Project. Where relevant to the Offshore Project, these are specified. Further details on limitations and assumptions of DAS are given in **Appendix 13.1. Volume 2c** and PAM in **Appendix 13.2. Volume 2c**. Limitations associated with other types of visual or acoustic survey data can be similar to those identified in the table but are study-specific. For the literature relied upon by this assessment, these are mentioned in the text, where relevant.

Table 13-10 Data Limitations relating to datasets used for the Assessment for Marine Mammals.

Data Limitation	Dataset type	Description
Surveying schedule	DAS	Inclement weather can mean that surveys are unable to take place, for safety reasons and/or because an increased sea state will limit visibility of targets within photographs. Due to poor weather conditions, 4 surveys during the winter months of December 2022, December 2023, January 2024 and February 2024 were rescheduled (see **Appendix 13.1. Volume 2c**). Data collected over the survey represent a snapshot of marine mammal occurrence and do not capture diurnal changes in presence. Due to long project lifecycles, DAS data may no longer represent the current baseline environment at the time of construction.
Survey design/sampling	DAS	The DAS aircraft was flown in equally spaced flight line transects, capturing approximately 30% of the sea surface of the surveyed area. Of all the photographic data collected in DAS, 10% of these were analysed, in a grid-based survey design. Therefore, some animals may have been at the surface and 'available' to be recorded but not recorded, due to sampling. Sampling is a standard approach, providing proportionality in surveys.
Availability bias	DAS	Marine mammals may be present during DAS, but they will only be captured by cameras if they are at or, in clearer waters, near to the surface at the time of the survey aircraft passing. This leads to an 'availability bias', whereby they are only sampled if they are 'available' to the surveyor. Availability bias can be managed by applying a species-specific correction factor to data. **Appendix 13.1, Volume 2c** discusses this in greater detail.
Observer bias	DAS	Observer bias occurs when an analyst may expect to see certain species within a dataset, and therefore species they are not expecting to see may be identified incorrectly. Controls for this are addressed within the quality assurance (QA) process.
Species identification	DAS	Identification of marine mammals to species level can be challenging from aerial survey imagery, particularly in inclement weather

Data Limitation	Dataset type	Description
		conditions, such as high sea states and high sun glare. Several marine mammal species were recorded during DAS which could not be identified to species level, and were therefore categorised as 'seal species', 'dolphin species' or 'dolphin/porpoise'. Seals were the most numerous marine mammal not identified to species level due to similarities between species, particularly the sizing overlap of females and juveniles.
Animals present but not recorded	PAM	PAM is an effective and well-established method for investigating presence and/or activity levels of cetaceans in an area of interest but cannot generally be used to produce density or abundance estimates for detected species. Animals are only detected if they vocalise and if that vocalisation is within the detection range of recording equipment. It is also possible for vocalisations to be undetected due to high levels of ambient noise in the marine environment ('masking'), or the orientation of the calling animal in relation to the acoustic array (Todd *et al.*, 2015). Therefore, additional cetaceans may have been in the vicinity of the Array Area but not detected.
False positives, false negatives and misclassifications	PAM	The process of analysing sounds and click detections can involve false positives (erroneously ascribing a sound to an animal species); false negatives (failure to identify a sound made by an animal); and misclassification (where sounds are assigned to the wrong species). Controls for this are addressed within the QA process (see **Appendix 13.2, Volume 2c**). Classifiers used to identify delphinid vocalisations are also not 100% accurate, with accuracy of identification varying between species.
Equipment malfunction/loss	PAM	Equipment malfunction and loss of equipment is an additional limitation of collecting acoustic data. Data loss occurred for both C-POD and F-POD click-detector recordings due to temporary loss of recording capability. This may have been due to a knock against the recorder or premature cessation linked to continuous noisy conditions. Noisy conditions increase the amount of data collected per unit of time, resulting in a shorter period before the available memory capacity is reached.

13.5.2.2 Despite the limitations described in **Table 13-10**, the baseline characterisation provides an informative, robust and recent account of marine mammals within the marine mammal Study Area. Data limitations are not anticipated to impact assessment conclusions and information presented within the baseline characterisation provides an appropriate basis for assessment.

13.5.3 METHODOLOGY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Introduction

13.5.3.1 The project-wide generic approach to assessment is set out in **Chapter 5, Volume 1a**. The following sections provide the assessment methodology used to assess the potential impacts on marine mammals only.

13.5.3.2 A matrix approach as described in **Chapter 5, Volume 1a** has been used to determine the significance of effects, by comparing impact magnitude against receptor value and sensitivity.

13.5.3.3 This methodology has been used to assess the construction, O&M, and decommissioning phases of the Offshore Project.

Impact assessment criteria

Magnitude

13.5.3.4 The magnitude of potential impacts on marine mammal receptors is based on the intensity or degree of disturbance to the baseline environment. Magnitude is categorised by 4 levels: high, medium, low or negligible. Definitions of magnitude are given in **Table 13-11**.

Table 13-11 Marine Mammal Magnitude Assessment Guidelines

Magnitude	**Guidelines**
High	Distribution, behaviour or condition of a sufficient proportion of the population will be affected to a degree that the Favourable Conservation Status (FCS) and/or the long-term viability of the population at a generational scale will be affected.
Medium	Some individuals will be affected to a degree that the FCS may be impacted in the short to medium term, although effects are likely reversible in the long term.
Low	A low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.
Negligible	Transient recoverable effect on a few individuals, within the envelope of natural variability. No potential effect on the FCS and/or the long-term viability of the population. Very short-term effect and no changes to population size or future trajectory.

Sensitivity (and value)

13.5.3.5 Marine mammals are afforded high levels of protection under UK and international legislations. ‘Value’ is, therefore, not considered to be an appropriate descriptor for categorisation. Marine mammals are instead assessed using ‘sensitivity’, in terms of the ability of a species to tolerate or adapt to change. Sensitivity is categorised by 4 levels: high, medium, low and negligible. Definitions of sensitivity are given in **Table 13-12.**

Table 13-12 Marine Mammal Sensitivity Assessment Guidelines

Sensitivity	Guidelines
High	Receptor has no ability to recover, adapt or tolerate an impact, resulting in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).
Medium	Receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).
Low	Receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.
Negligible	Receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Significance

13.5.3.6 Following the identification of the magnitude of impact and feature sensitivity it is possible to determine the significance of effect. The matrix provided in **Table 5-4** in **Chapter 5, Volume 1a** is used as a framework to aid in determination of the impact assessment and provides further detail of what effect is considered to be significant.

13.5.4 ASSESSMENT OF UNDERWATER NOISE

Overview

13.5.4.1 As per the identified spatial scope of the assessment (Section 13.4.2), there is potential for the impact of underwater noise to result in auditory injury or disturbance to marine mammals, to a greater geographical extent than other impact pathways. To understand the extent and magnitude of the noise levels produced in the different phases of the Offshore Project, underwater noise modelling was carried out (see **Appendix 13.3**, **Volume 2c**) for piling and other construction activities; this forms the basis of the quantitative assessment of auditory injury and disturbance from piling, and auditory injury from other construction noise, for marine mammals. Disturbance from other construction noise is assessed qualitatively, based on evidence published in the literature.

13.5.4.2 The outputs of the noise modelling were used with the marine mammal density estimates carried forward to the EIA from the baseline (see Section 13.6.1) to calculate the number of animals of each species receiving an auditory injury and the numbers disturbed by noise. For those receptors where parameters were available, population modelling was then undertaken to quantify the potential for future, population-level effects from the pile-driving impact pathways, both for the Offshore Project alone and cumulatively with the piling of other developments (see **Appendix 13.4**, **Volume 2c**).

13.5.4.3 For underwater noise impact pathways, the magnitude of impact is based upon the number of affected animals and the implications on the population, according to the definitions of magnitude in relation to FCS, given in **Table 13-11**.

13.5.4.4 Sensitivity of the receptor is discussed in the text relating to that particular impact, because receptors may have differing sensitivities to different noise types. Sensitivity of each receptor for each impact is determined according to the definitions given in **Table 13-12**.

13.5.4.5 The key stages of analysis and considerations informing the EIA are discussed in more detail, in the following sections:

- Underwater noise modelling;
- Understanding noise exposure;
- Calculating auditory injury;
- Calculating disturbance;
- Population modelling.

Underwater noise modelling

13.5.4.6 Underwater noise modelling was undertaken by Subacoustech Environmental Limited and is provided within **Appendix 13.3, Volume 2c**. Modelling predicts sound propagation for the installation of individual foundations, based on environmental features, such as bathymetry, and engineering approach, such as pile diameter, hammer energy, strike rate and piling duration.

13.5.4.7 As part of the embedded mitigation strategy to reduce noise levels to the south of the Turbine Area near Loch Roag/*Loch Ròg*, which is of ecological importance to Atlantic salmon *Salmo salar* (see **Chapter 12, Volume 2a**), the Turbine Area was divided into sections, with different engineering approaches for each. The southwestern section (dark blue in **Plate 13-4**) will use a drill-and-grout approach only (Percussive Piling Exclusion Zone), to keep noise levels to a minimum. Hence, no modelling locations have been selected in this area. Two types of impact piling will be used in the rest of the Turbine Area, with hammer energies progressively increasing in bands, from west to east. The area closest to Loch Roag/*Loch Ròg* will use the lowest hammer energies (maximum 2,500kJ; red-hatched area). The next band will use a maximum of 3,500 kJ (orange-hatched area) and the easternmost band (blue-hatched area) will use up to 5,000 kJ of hammer energy. An area of deeper water, referred to as the 'buried channel', is delineated in **Plate 13-4** in purple. Inside the buried channel, pin piles will be installed. Outside the buried channel (but still within the piled section), pile casings will be installed. Both pin piles and pile casings are steel cylinders of 5 m diameter; the main difference in how they are modelled is piling duration. Further details can be found in **Appendix 3.1: Percussive Piling Installation Approach**, **Volume 1c**.

13.5.4.8 6 modelling locations were selected within the Turbine Area to represent the diversity of the environmental conditions and the engineering approaches used as embedded mitigation. Piling was modelled both with and without the Applicant's commitment to a 12 dB reduction in sound level (**Appendix 3.1, Volume 1c**). A semi-empirical model, the INSPIRE underwater noise model, incorporated measured noise propagation data from offshore piling operations with standard acoustic theory, to calculate the propagation of noise in mixed waters of less than 100 m depth.

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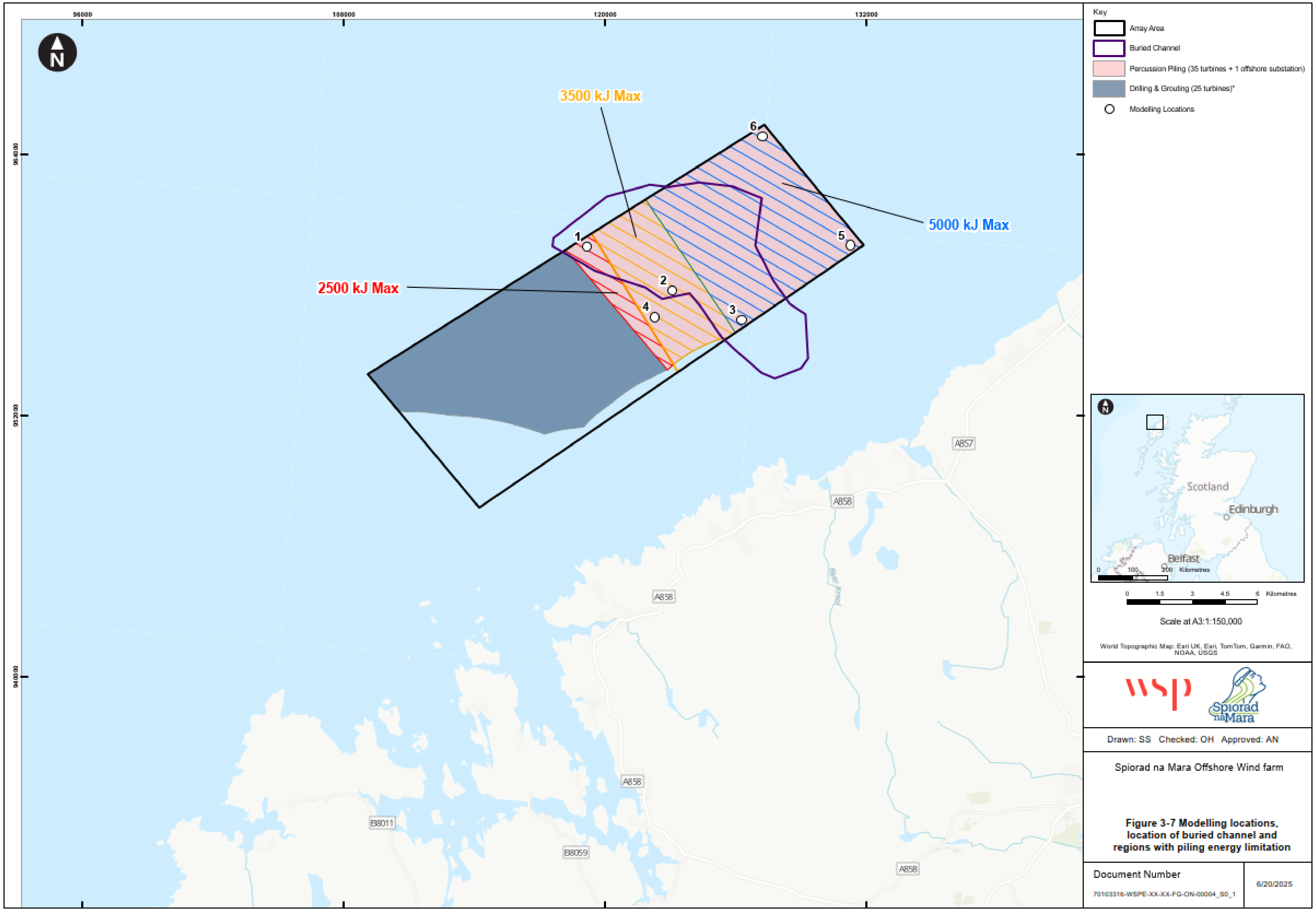
Plate 13-4 Map of underwater noise modelling locations 1 to 6, indicating the Percussive Piling Exclusion Zone (dark blue), presence of the buried channel (purple) and different hammer energies used (3 hatched areas)



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13.5.4.9 Modelling was also carried out for other noise-producing activities within the construction phase, and for operational noise from WTGs. For these, a simpler model based on measurement data was used, as per the National Physical Laboratory (NPL) Good Practice Guide 133 for underwater noise measurements (Robinson *et al*., 2014). The guide states that, under certain circumstances, such an approach may be more appropriate where lower sound levels are predicted and where detailed modelling would imply a level of accuracy that would not be justified. No environmental parameters were therefore included in this modelling.

13.5.4.10 Outputs of the modelling relevant to the marine mammal assessment include noise contours that have had auditory weighting functions applied to them. Marine mammal hearing and noise criteria are discussed in the next section.

Understanding noise exposure

13.5.4.11 The loudest underwater sounds, such as explosions, create large pressure fluctuations that can cause death, internal injuries or barotraumas, should animals be in close range. Pile driving does not cause such extensive trauma but is loud enough to cause permanent or temporary (recoverable) damage to marine mammal hearing organs. Intense and/or long-term/repeated noise exposures can cause damage to the hearing organs, temporarily or permanently altering the threshold of hearing. This does not mean that animals are deafened (Booth and Heinis, 2018), but that a reduction in hearing sensitivity has taken place at a particular frequency or range of frequencies. If the hearing threshold returns to normal, it is referred to as a temporary threshold shift (TTS). If the hearing threshold does not return to normal, but leaves a residual noise-induced threshold shift, this is referred to as a permanent threshold shift (PTS) (Finneran, 2015).

13.5.4.12 Given the greater noise exposure required to result in PTS, and that TTS does not always lead to PTS, TTS noise extents can be wide ranging. Therefore, consideration of TTS as auditory injury would be overly precautionary, especially as PTS criteria are already conservative in themselves and contours represent the onset of effects. As such, for developments in Scottish waters, TTS is not typically reported in impact assessment sections relating to auditory injury (e.g. Caledonia Offshore Wind Farm (Caledonia Offshore Wind Farm Limited, 2024); Pentland Firth Offshore Wind Farm (Highland Wind Limited, 2022); and West of Orkney Offshore Wind Farm (Offshore Wind Power Limited, 2023)). This is also the approach applied in this assessment.

13.5.4.13 TTS is, however, presented in this methodology section as it forms the basis of PTS noise criteria calculations and research into effects of noise exposure on marine mammals. Full results of modelled TTS onset contours can be found in **Appendix 13.3, Volume 2c**. Throughout this chapter, the term 'auditory injury' is used to describe the effects created by PTS, while 'PTS' is used to specifically denote metrics associated with auditory injury.

13.5.4.14 Marine mammals have evolved different frequency-specific hearing sensitivities, in response to the range of sounds they are likely to encounter in their environment and relating to their life history traits. These different sensitivities influence how they are affected by noise exposure. Southall *et al.*

(2007) categorised marine mammals into 'hearing groups', based on phylogenetic differences and auditory, physiological and behavioural characteristics and this was revised with further research into audiometric and physiological data into the hearing groups given in the 2019 update to that paper (Southall *et al.*, 2019). The baleen whales have a lower hearing range and are classed as low-frequency (LF) cetaceans, most of the toothed whales/dolphins fall into the high-frequency (HF) cetacean category, while the harbour porpoise is part of the very-high-frequency (VHF) category (**Table 13-13**). Pinnipeds are given two categories: in air and in water, only the latter of which is relevant to this assessment (**Table 13-13**).

Table 13-13 Marine mammal hearing groups (* after Southall *et al.*, 2019; ^ after NMFS, 2016)

Marine Mammal Hearing Group*	Auditory Weighting Function*	Species Scoped into the EIA	Generalised Hearing Range^
Low-frequency cetaceans	LF	Minke whale, humpback whale and fin whale	7 Hz-35 kHz
High-frequency cetaceans	HF	White-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species.	150 Hz-160 kHz
Very-high-frequency cetaceans	VHF	Harbour porpoise	275 Hz-180 kHz
Phocid carnivores in water	PCW	Grey seal and harbour seal	50 Hz-86 kHz

13.5.4.15 The auditory weighting functions of each hearing group, shown in **Table 13-13**, are applied in the underwater noise modelling as frequency-specific filters, quantifying the effects of noise, based on the susceptibility of that species to different frequencies of sound. The weighted noise exposure level is then compared to a weighted threshold. The threshold represents the exposure level for the onset of TTS or PTS. If the weighted noise exposure level is greater than the threshold, then it is assumed that TTS or PTS, respectively, will occur. The process of determining weighting functions and thresholds is discussed in detail in Southall *et al.* (2019). The term 'noise criteria' is used going forwards in this chapter to refer to weighting functions and thresholds collectively.

13.5.4.16 Southall *et al.* (2019) give different noise criteria for impulsive and non-impulsive sound sources. This is because the 2 types of sound have different acoustic characteristics and impacts, with impulsive sound being more injurious, due to a fast rise and decay time. Percussive pile driving is both loud and impulsive. Thresholds for impulsive sound use a dual metric approach, where a weighted sound exposure level (SEL) is used in conjunction with an unweighted peak sound pressure level (SPL) threshold. This is on the basis that, should either threshold be exceeded, this would be sufficient to bring TTS or PTS onset.

13.5.4.17 The acoustic metrics account for different aspects of exposure level and duration, with SEL being a proxy for sound energy exposure over time and/or multiple exposures, and SPL a measure of absolute maximum exposure or 'instantaneous TTS/PTS'. SEL values are calculated over the entirety of the noise exposure or repeated exposures. They are then presented with a reference duration, in order to allow comparison of total energy between values calculated over different time periods. Further detail of acoustic terminology is provided in Section 2 in **Appendix 13.3, Volume 2c**.

13.5.4.18 For thresholds of non-impulsive or continuous noise, only the frequency-weighted SEL metric and not an unweighted peak SPL is used. Given the relatively longer duration of these types of sounds, e.g. vessel noise or drilling, and the high peak SPLs that are needed to induce TTS or PTS, the SEL criterion would generally never go un-met before reaching a peak SPL criterion; thus, only the SEL is presented in Southall *et al.* (2019).

13.5.4.19 **Table 13-14** presents the impulsive noise thresholds for onset of TTS and PTS in each of the marine mammal hearing groups relevant to this assessment, while **Table 13-15** provides thresholds for non-impulsive/continuous noise (Southall *et al.*, 2019).

Table 13-14 TTS and PTS thresholds for impulsive noise relevant to this marine mammal assessment (after Southall *et al.*, 2019)

Marine Mammal Hearing Group	TTS onset		PTS onset	
	SEL weighted (dB re 1μPa²s)	Peak SPL unweighted (dB re 1μPa)	SEL weighted (dB re 1μPa²s)	Peak SPL unweighted (dB re 1μPa)
LF	168	213	183	219
HF	170	224	185	230
VHF	140	196	155	202
PCW	170	212	185	218

Table 13-15 TTS and PTS thresholds for non-impulsive noise relevant to this marine mammal assessment (after Southall *et al.*, 2019)

Marine Mammal Hearing Group	TTS onset	PTS onset
	SEL weighted (dB re 1μPa²s)	SEL weighted (dB re 1μPa²s)
LF	179	199
HF	178	198
VHF	153	173
PCW	181	201

Calculating auditory injury

13.5.4.20 To calculate the number of animals receiving an auditory injury from piling and other construction noise, the most precautionary density value of those identified for each species in the baseline summary tables (see **Table 13-23** for values taken through to the EIA) was multiplied by the area determined by underwater noise modelling to be above the threshold for onset of PTS for each marine mammal hearing group, to give number of injured animals. An assumption is made with this method that all animals of a species, and of a hearing group, are affected by PTS at the prescribed threshold, whereas it would be expected that some variation exists between individuals (Finneran, 2015). For piling noise, a further assumption is that noise continues to be perceived in its more injurious impulsive form, with increasing distance. It is however understood that sound loses its impulsive nature with increasing distance from the source, acquiring characteristics of continuous sound sources (Matei *et al.*, 2024; see **Appendix 13.3, Volume 2c** for further discussion). This adds further conservatism to the calculations of numbers of injured animals.

13.5.4.21 While calculations were made for all underwater noise modelling locations, only results from the worst-case scenario location are presented in the relevant assessment sections (Sections 13.8.1 and 13.8.3), i.e. Location 6, which is the location with the greatest extent for noise propagation and the highest number of animals affected (see **Appendix 13.3, Volume 2c)**. This is a precautionary approach because it assumes that the piling of any location within the Array Area will injure the same number of animals as predicted for Location 6.

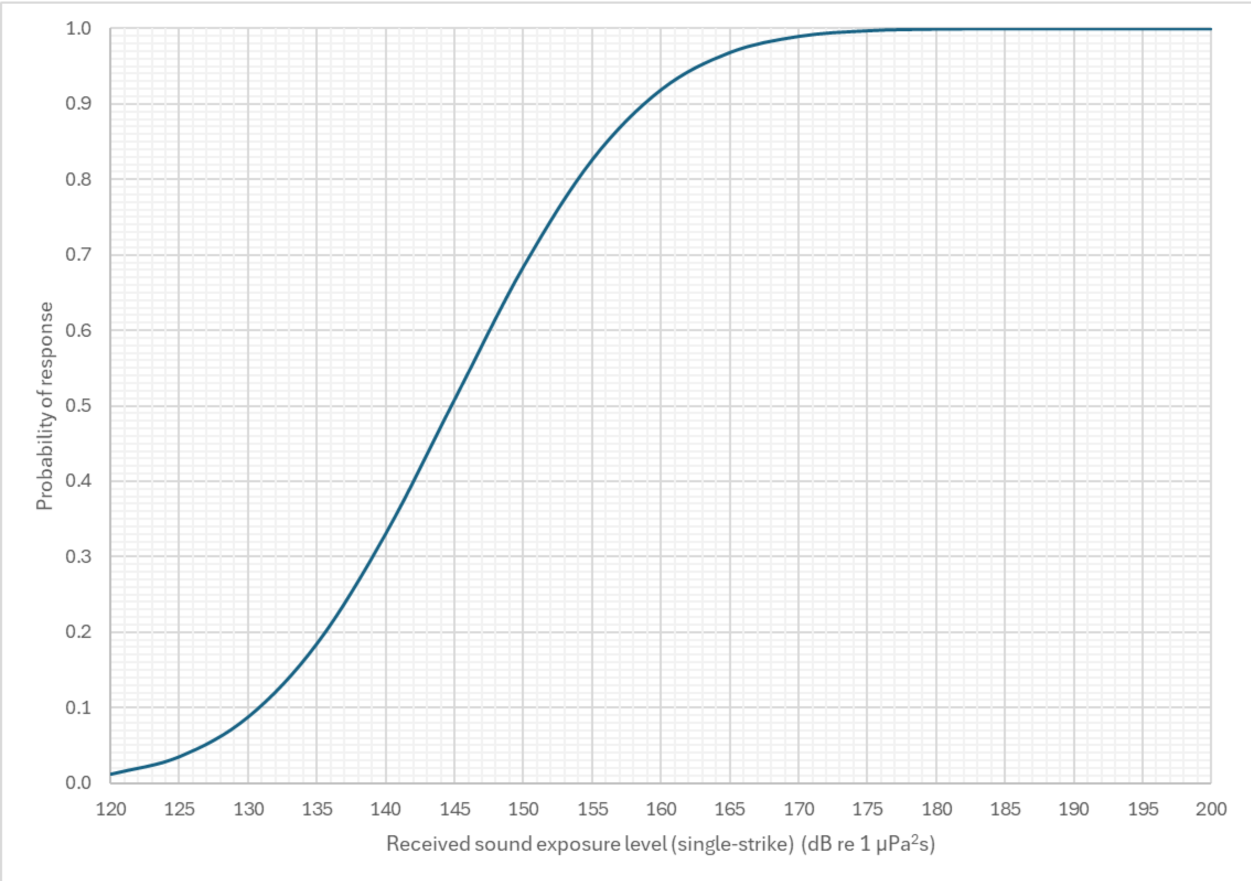
Calculating disturbance

13.5.4.22 For disturbance, use of a uniform density estimate across the entire extent of noise propagation would vastly overestimate the numbers of affected animals. Instead, cetacean modelled density surfaces from Lacey *et al.* (2022) and seal habitat-based distribution estimates from Carter *et al.* (2020) provided a higher spatial resolution, to produce a more realistic estimate of numbers. For cetaceans, the predictions are based upon SCANS (and other) survey data and environmental data. For seals, the predictions are based upon tracking data, environmental data and haulout survey data. Unweighted single-strike SEL noise contours were provided as an output of the underwater noise modelling assessment, in decreasing steps of 5 dB. These were overlaid by the fine-scale spatial density estimates in GIS and numbers of animals were calculated from the mean density of each contour.

13.5.4.23 While this gives an estimate of how many animals are to be found in that contour, it could be expected that a higher level of response would occur in the higher noise level contours, closer to the piling activity. Additionally, not every animal will respond to the same stressor in the same way. To take account of the graduated level of impact and behavioural differences between individuals of a species, a dose-response function was applied to each 5 dB contour before summing the number of animals across the contours.

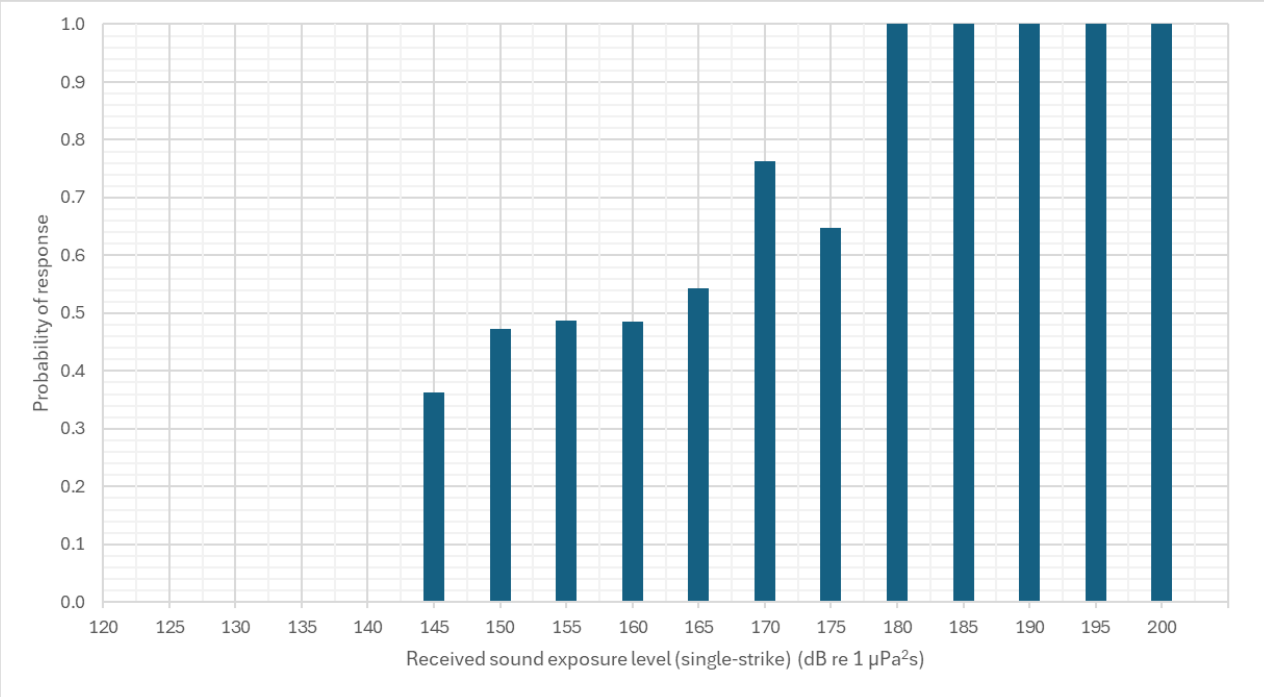
13.5.4.24 For cetaceans, the results reported on harbour porpoises from a study at the Beatrice Offshore Wind Farm in the Moray Firth (Graham *et al.*, 2017) were recommended by NatureScot to be used as a dose-response function for all species (in the absence of studies of this kind on any further cetaceans). The Beatrice study used PAM to monitor porpoise activity and found that harbour porpoise responses to piling were best explained by the distance from piling, followed by single-strike SELs. A 'behavioural response' was considered to have occurred once more than 50% of animals had moved away from the source noise in the 24 hours after piling cessation. The relationship between distance or single-strike SEL and the probability of a response was used as a dose-response function (see **Plate 13-5**).

Plate 13-5 Dose-response curve for harbour porpoise, using unweighted SEL_{ss} (based on Graham *et al*. 2017)



13.5.4.25 For seals, an equivalent study from Whyte *et al.* (2020) used seal tracking and pile driving predictive modelling to quantify the effects and investigate the sensitivity of seals to piling noise. Predicted harbour seal densities significantly decreased within 25 km or above SEL_{ss} of 145 dB re 1 $\mu Pa^2 \cdot s$ during pile driving, according to distance and sound level. However, there was substantial variation in the relationship. This paper provided the dose-response function for harbour seals and was recommended to also be used for grey seals (see **Plate 13-6**).

Plate 13-6 Dose-response curve for harbour seal, using unweighted SEL_{ss} (based on Whyte *et al*. 2020)



13.5.4.26 In each case, the use of the function for other species within the group provides a conservative estimate, as harbour porpoises and harbour seals have been shown to be more sensitive and less resilient to disturbance.

13.5.4.27 While calculations were made for all underwater noise modelling locations, only results from the worst-case scenario location are presented in the assessment section (Section 13.8.2), i.e. Location 6, which is the location with the greatest extent for noise propagation and the highest number of animals affected. This is a highly precautionary approach because it assumes that the piling of any location within the Array Area will disturb the same number of animals per day as predicted for Location 6.

13.5.4.28 Disturbance from other construction noise was not assessed quantitively, as above, but instead qualitatively, by reviewing the literature.

Population modelling

13.5.4.29 To further inform the impact assessment in terms of magnitude of effect, the potential population-level effects of auditory injury and disturbance resulting from pile driving were quantified with population modelling. This was undertaken on the worst-case scenario piling location only, using the Interim Population Consequences of Disturbance (iPCoD) framework. iPCoD modelling was undertaken by SMRU Consulting in support of the assessment and is provided within **Appendix 13.4, Volume 2c**. iPCoD was designed to be used to model the effects of piling activities and is therefore not used for the assessment of non-piling noise impacts.

13.5.4.30 iPCoD uses the results of an expert elicitation process (most recently updated in 2018; Booth and Heinis, 2018; Booth *et al.*, 2019), in place of empirical data, to predict the effects of PTS and disturbance on survival and reproductive rate. The model is used to run a number of simulations of future population trajectory, with and without the predicted level of impact, to allow an understanding of the potential future population-level consequences of predicted behavioural responses. Each simulation is run with matched pairs of populations: 1 un-impacted and 1 impacted. The only variable element is that one population is subjected to a stressor: impulsive noise. The 2 populations can, therefore, be compared in terms of their trajectories, to determine the potential effect of disturbance.

13.5.4.31 Life history information used as parameters for iPCoD are currently only available for 5 species of marine mammal in UK waters: harbour porpoise; bottlenose dolphin *Tursiops truncatus*; minke whale; grey seal; and harbour seal. Population modelling was therefore only undertaken for these receptors. Modelling was carried out for the Project alone and for the cumulative assessment.

13.5.4.32 To carry out population modelling using iPCoD, the defined population MU/SMU (see **Table 13-17** and **Table 13-20**) is required for relevant species. For the EIAR, the use of UK portions of MUs/SMUs were used, which represent the most appropriate spatial scale at which realistic assessments of animals can be carried out. Demographic information including population size, age structure, birth rates, age-specific survival rates, age at first breeding and sex ratio are also required, in addition to an estimate of animals affected daily, days of disturbance (piling schedule) and relationship between days of disturbance and individual survival (Sparling *et al.,* 2017).

13.5.4.33 For other marine mammal receptors included in this EIA, for which iPCoD parameters were not available, indicative population trajectories were based on numbers of animals affected by PTS/disturbance and the percentage of the UK MU population that those represented, supported by information in the literature to provide a qualitative assessment.

13.6 BASELINE CONDITIONS

13.6.1 CURRENT BASELINE

13.6.1.1 Baseline data collection has been undertaken to obtain information for the Study Area described in Section 13.4. A summary of the baseline environment has been derived from the results of the desk study data and site-specific surveys detailed in Section 13.5.1 and is outlined in this section.

13.6.1.2 This section describes the current marine mammal baseline environment within the marine mammal Study Area, including cetaceans (whales, dolphins and porpoises) and pinnipeds (seals). A desk-based review has been undertaken to understand marine mammal presence in the Study Area using the most recent publicly available data, supplemented by site-specific DAS and PAM.

Cetaceans

13.6.1.3 The west coast of Scotland/*Alba* is a globally important region for cetaceans with 24 species being recorded within Hebridean waters, with 15 of these being recorded annually (Hartny-Mills *et al.*, 2024). The most frequently observed cetacean species off the coast of northwest Lewis/*Leòdhais* include harbour porpoise, white-beaked dolphin *Lagenorhynchus albirostris*, common dolphin *Delphinus delphis*, common bottlenose dolphin, Risso's dolphin *Grampus griseus*, and minke whale (Hartny-Mills *et al.*, 2024; Hague *et al.*, 2020; Reid *et al.*, 2003.

13.6.1.4 Other species which may be present in the Study Area include Atlantic white-sided dolphin *Lagenorhynchus acutus*, long-finned pilot whale *Globicephala melas*, killer whale, humpback whale, fin whale, and beaked whale species of the family Ziphiidae (HWDT, 2018; Reid *et al.*, 2003).

13.6.1.5 Cetacean species only recorded infrequently in the region, including sperm whale *Physeter macrocephalus* and sei whale *Balaenoptera borealis* (Hague *et al.*, 2020), are not discussed further.

13.6.1.6 Designated sites where cetacean species are listed as qualifying features within the marine mammal Study Area are presented within **Figure 13.2, Volume 2b** (alongside those listed in the pinniped baseline) and listed in **Table 13-16**. The assessment of likely significant effects on the Inner Hebrides and the Minches SAC falls within the Habitats Regulations Assessment and is therefore assessed within the RIAA.

13.6.1.7 MPAs are designated separately under The Marine (Scotland) Act 2010. An authority must not grant authorisation for an activity unless it can be demonstrated that there is no significant risk to achieving the site's conservation objectives. In line with the request from NatureScot (Section 13.3.4), the North-east Lewis and Sea of the Hebrides MPAs are assessed in this EIAR chapter.

Table 13-16 Protected areas for cetaceans

Designated Site	Closest Distance to Offshore Project (km)	Qualifying Feature
Special Areas of Conservation		
Inner Hebrides and the Minches	43	Harbour porpoise
Marine Protected Areas		
North-east Lewis	22	Risso's dolphin
Sea of the Hebrides	94	Minke whale

Harbour porpoise

Ecology and Conservation

13.6.1.8 Harbour porpoises are the smallest cetacean species in the northeast Atlantic. Their preferred habitat is shallow, continental shelf waters between 50-150 m depth with sloping topography (Booth *et al.*, 2013). Harbour porpoise diet is varied and is composed of a range of fish, squid, and shellfish from both demersal and pelagic habitats. Within Scottish waters their prey composition is primarily made up of small shoaling fish which are taken on or near to the seabed. Their main prey species include whiting *Merlangius merlangus*, sandeels Ammodytidae, and haddock *Melanogrammus aeglefinus* (Booth *et al.*, 2013; Santos and Pierce, 2003). Harbour porpoises are usually recorded alone or in small groups, however large aggregations have been recorded in the Hebrides (HWDT, 2018).

13.6.1.9 Harbour porpoise females give birth once a year. Mating occurs in July and August, with the gestation period lasting 10-11 months. Calving occurs the following year from April-July (Evans *et al.*, 2011; Learmonth *et al.*, 2014). Calves are weaned after approximately 12 months (Evans *et al.*, 2011).

13.6.1.10 Harbour porpoise is a species of least conservation concern on the International Union for Conservation of Nature (IUCN) red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends and habitat availability (Braulik *et al.*, 2023; JNCC, 2019a).

13.6.1.11 Harbour porpoise is listed under Annex II of the Habitats Directive as a species of Community Interest, which has been transposed into Scottish law through the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. This legislation requires the designation of SACs for the species. Harbour porpoise is a primary feature of the Inner Hebrides and the Minches SAC, which does not overlap with the Offshore Project, but is located within the marine mammal Study Area (NatureScot, 2020). Harbour porpoises are also a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012).

13.6.1.12 Important Marine Mammal Areas (IMMAs) are defined as discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. A total of 2 IMMAs are present within the marine mammal Study Area, including the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (in which the Array Area is situated) and the Minches and the Sea of the Hebrides IMMA (off the east coast of the island, 22 km at its closest point to the Array Area). The harbour porpoise is listed as a species supported by each of these areas, with the latter identified as important for breeding (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.13 The abundance of harbour porpoise in the West Scotland MU is 28,936 (CV=0.16; 95% CI= 21,140-39,608), with an estimated 24,305 (CV=0.18; 95% CI= 17,121-34,505) within the UK portion of the MU (IAMMWG, 2023).

13.6.1.14 Harbour porpoises are present across the west coast of Scotland/*Alba* and the Outer Hebrides/*Na h-Eileanan*, including within the marine mammal study area, throughout the year (Gilles *et al.*, 2023; HWDT, 2018; 2024). Harbour porpoise distribution is heavily influenced by topographical variables such as seabed depth and slope, which is likely explained by prey preferences and availability, with their likely preference of deeper, coastal areas and strong tidal currents (Booth *et al.*, 2013; Hartny-Mills *et al.*, 2024).

13.6.1.15 Information from the SCANS surveys relating to cetacean receptors is included within **Table 13-17** and **Table 13-18**, and relevant survey blocks are presented within **Plate 13-1**. The most recent SCANS-IV survey provides an estimated harbour porpoise abundance of 1,276 (CV=0.907; 95% CI=4-4,246) in block CS-I (Gilles *et al.*, 2023). This is a decrease compared to the previous SCANS-III survey of the equivalent block J, which had an estimated abundance of 2,045 (CV=0.72; 95% CI=0-5,313). Within block CS-J there is an estimated harbour porpoise abundance of 3,231 (CV=0.569; 95% CI=620-7,758), compared to the previous SCANS-II survey which estimated 9,999 (CV=0.27; 95% CI=5,643-16,306) porpoises within block K (Hammond *et al.*, 2021). SCANS-IV survey blocks CS-I and CS-J cover the same surveyed area as SCANS-III blocks J and K, respectively.

13.6.1.16 During 2023 ORCA surveys, harbour porpoises were recorded within the Study Area with a maximum of 1.7-3.3 sightings per 100 km in the north of the Minch/*Mhaoil*, with 0.4-1.7 sightings per 100 km throughout rest of the Minch/*Mhaoil* and toward the Sea of the Hebrides/*An Cuan Barrach* (ORCA, 2024).

13.6.1.17 Site-specific surveys for the Offshore Project recorded harbour porpoises throughout both years of DAS. Harbour porpoises were recorded from March-July and in September in 2022, January-July and in September and October in 2023, and in January and February of 2024. Peak abundance occurred in January 2024 with an abundance estimate of 1,331 (95% CI=442-2,479) (**Appendix 13.1, Volume 2c**). There was no observed distribution pattern for harbour porpoises as they occurred across all seasons for both survey years (**Appendix 13.1, Volume 2c**).

13.6.1.18 Vantage point surveys for the Oyster Wave Array, which were carried out in near-shore waters adjacent to the Array Area, from September 2010-September 2011 recorded harbour porpoises within the Study Area during September, November, December, March and August (Royal Haskoning, 2012).

13.6.1.19 Harbour porpoises were monitored during PAM surveys for the Offshore Project from January 2024-February 2025, with data being available for Site 1 (SW) for all 3 deployments, and Site 2 (NE) for Deployment 3 only. Using a combination of C-POD and F-POD data, harbour porpoises were detected on 251 days which accounted for 73.6% of the monitoring days at Site 1 (SW) and 91 days at Site 2 (NE) which accounted for 56.2% of the monitoring days. Generally, porpoise presence was recorded on 5-7 days per week from late autumn through to mid-summer, with a noticeable decline in detections from late summer into early autumn. Across all 3 deployments, the rates of porpoise detection were low, with 0.00-1.54 daily average PPM per hour and up to 22 PPMs for specific hours. There were no specific period(s) of increased porpoise detections identified at either monitoring locations. However, diel assessment data were available for most of the year at Site 1 (SW) and identified that porpoise were primarily detected at night, between sunrise and sunset. In contrast, the spring and summer detections were more spread out, with no distinct diel pattern (**Appendix 13.2, Volume 2c**).

Density

13.6.1.20 Persistent high-density areas for harbour porpoises have been identified in coastal areas off northwest Scotland/*Alba*, including within the Minches/*Mhaoil* and eastern parts of the Sea of Hebrides/*An* Cuan *Barrach*, which overlaps with the marine mammal Study Area, but does not overlap with the Offshore Project's Array Area (Heinänen and Skov, 2015).

13.6.1.21 SCANS-IV surveys carried out in 2022 provide a density estimate of 0.0364 (CV=0.907) animals/km² within block CS-I, which is lower compared to the previous SCANS-III surveys which had estimated density at 0.058 (CV=0.72) animals/km² within the comparable block J. Density within SCANS-IV block CS-J was estimated at 0.0994 (CV=0.569) animals/km² which was also lower than the comparable SCANS-III block K, with a density estimate of 0.308 (CV=0.27) animals/km² (Gilles *et al.*, 2023; Hammond *et al.*, 2021).

13.6.1.22 SCANS-III data were also used to provide information on summer distribution by modelling data and relating it to spatially linked environmental features to generate density surface maps (Lacey *et al.*, 2022). Modelled density surface estimates of SCANS-III data estimated harbour porpoise density at 0-0.4 animals/km² within the marine mammal study area, with densities further offshore and southwest of the Hebrides estimated at 0.00-0.05 animals/km² (**Figure 13.3, Volume 2b**); Lacey *et al.*, 2022). This is a decrease in estimated density compared to the previously modelled survey data from 2005/07, which estimated density at 0.50-0.75 animals/km² in the vicinity of the Offshore Project (Lacey *et al.*, 2022). Distributional shifts in harbour porpoise observed in the Celtic and North Seas have been suggested and may relate to this decrease in density estimates within the Outer Hebrides/*Na h-Eileanan Sia* (Lacey *et al.*, 2022).

13.6.1.23 Over the 2 years of site-specific DAS surveys for the Offshore Project, the peak density for harbour porpoise was the January 2024 estimate of 1.39 individuals/km² (**Appendix 13.1, Volume 2c**). The species was recorded from March-September 2022, January-July 2023 and September-October 2023 and January-February 2024. There were no obvious patterns in distribution across the survey period (**Appendix 13.1, Volume 2c**).

White-beaked dolphin

Ecology and Conservation

13.6.1.24 White-beaked dolphins are present along shelf waters in northwest Europe and are a regularly occurring species within Scottish waters where they are present year-round (MacLeod, 2013). Their preferred habitat is shallow, continental shelf waters, however on the west coast of Scotland/*Alba* the species is regularly recorded in offshore waters (HWDT, 2018; Gilles *et al.*, 2023). White-beaked dolphin diet is varied and includes species such as whiting, cod *Gadus morhua*, haddock, small schooling fish such as sandeels and herring *Clupea harengus*, as well as crustaceans and squid

(HWDT, 2018; MacLeod, 2013). White-beaked dolphins are regularly recorded in small groups of approximately 5-20 individuals, however large aggregations have been recorded in the Outer Hebrides/*Na h-Eileanan Sia* (HWDT, 2018; MacLeod, 2013).

13.6.1.25 White-beaked dolphins have a gestation period of approximately 11 months, with a mating season from July-August (Culik, 2010).

13.6.1.26 White-beaked dolphin is a species of least concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (JNCC, 2019b; Kiszka and Braulik, 2018a).

13.6.1.27 The designation of MPAs is not required for white-beaked dolphins in Scottish waters. There are no protected areas within the marine mammal Study Area where white-beaked dolphins are listed as a primary feature or feature of interest. White-beaked dolphins are, however, a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). White-beaked dolphins are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.28 The estimated abundance of white-beaked dolphins in the Celtic and Greater North Seas MU is 43,951 (CV=0.22; 95% CI= 28,439-67,924), with an estimated 34,025 (CV=0.28; 95% CI=20,026-57,807) within the UK portion of the MU (IAMMWG, 2023).

13.6.1.29 White-beaked dolphins are distributed throughout open waters around the Outer Hebrides/*Na h-Eileanan Sia* and the north Minch/*Mhaoil*, including within the marine mammal study area (Hague *et al.*, 2020; HWDT, 2018; Paxton *et al.*, 2014). Sightings are seasonal, with an increase in coastal records during summer months, particularly between June and August (Canning *et al.*, 2008; HWDT, 2018; Paxton *et al.*, 2014). In summer, sightings occur predominantly in the north Minch/*Mhaoil* and west of the Isle of Harris/*Na Hearadh* (Hartny-Mills *et al.,* 2024). A decline in white-beaked dolphin sightings has been observed in the Minch/*Mhaoil* since the 1990s, coinciding with an increase in common dolphin sightings (Weir *et al.*, 2009). A change in the seasonal pattern of strandings in the UK may indicate that white-beaked dolphin's range is decreasing within UK waters (Canning *et al.*, 2008; MacLeod, 2013).

13.6.1.30 The most recent SCANS surveys carried out in 2022 provide a white-beaked dolphin abundance estimate of 8,335 (CV=0.596; 95% CI=55-19,218) within block CS-J (Gilles *et al.*, 2023). No abundance estimate is available for SCANS-IV block CS-I. SCANS-III block J had an estimated abundance estimate of 1,871 (CV=0.91; 95% CI=0-5,856). Block K had an estimated 7,055 (CV=0.53; 95% CI=1,799-16,040) white-beaked dolphins, which is a decrease compared to SCANS-IV estimates (Hammond *et al.*, 2021).

13.6.1.31 During 2023 ORCA surveys, white-beaked dolphin had a sightings rate per 100 km of 0-0.22 throughout the Minches/*Mhaoil* (ORCA, 2023).

13.6.1.32 Site-specific surveys for the Offshore Project recorded no white-beaked dolphins during the first year of DAS (**Appendix 13.1, Volume 2c**). During the second year of DAS, white-beaked dolphins were recorded in May 2023 and January 2024 within the Offshore Project's 10 km buffer (**Appendix 13.1, Volume 2c**). Peak abundance occurred in May 2023 with an estimate of 52 (95% CI=6-155).

13.6.1.33 No white-beaked dolphins were recorded during site-specific vantage point surveys for the nearby Oyster Wave Array from September 2010-September 2011.

13.6.1.34 White-beaked dolphins were regularly detected during PAM surveys for the Offshore Project throughout all deployments and were the third most frequently recorded delphinid species from the surveys (**Appendix 13.2, Volume 2c**). The species was identified on 107 days from January 2024-February 2025, representing 30.4% of the total monitored time. There were no clear seasonal patterns observed, however, the species was more frequently detected at Site 1 (SW). At this location, the highest number of detection weeks generally occurred between May-October. There was an increase in detections at the start of Deployment 2 at Site 2 (NE) in May, with the highest weekly percentage of detections recorded in September (**Appendix 13.2, Volume 2**).

Density

13.6.1.35 The highest densities of white-beaked dolphin on the west coast of Scotland/*Alba* are in the region to the northeast of the Isle of Lewis/*Eilean Leòdhais* and the north Minch/*Mhaoil* (Paxton *et al.*, 2014).

13.6.1.36 No white-beaked dolphins were recorded within block CS-I of the SCANS-IV surveys (Gilles *et al.*, 2023). The previous SCANS-III survey estimated a density of 0.053 (CV=0.91) animals/km² in the comparable block J. SCANS-IV estimated white-beaked dolphin density to be 0.2565 (CV=0.596) animals/km² in Block CS-J which is an increase compared to the 0.217 (CV=0.53) animals/km² estimated for SCANS-III block K. Modelled density surface estimates of SCANS-III data estimated white-beaked dolphin density to be 0.0-0.3 animals/km² within the marine mammal Study Area (**Figure 13.4, Volume 2b**; Lacey *et al.*, 2022). This is an increase in density compared to the previously modelled SCANS survey data from 2005, which estimated white-beaked dolphin density to be up to 0.1-0.2 animals/km² in the vicinity of the Offshore Project (Lacey *et al.*, 2022).

13.6.1.37 Due to a lack of sightings, no density estimates are available for white-beaked dolphin during the first year of site-specific DAS for the Offshore Project. White-beaked dolphin density during the second year of DAS peaked in May 2024, with a density estimate of 0.05 individuals/km² (**Appendix 13.1, Volume 2c**).

Common dolphin

Ecology and Conservation

13.6.1.38 Common dolphins are wide ranging and are present throughout the northeast Atlantic where they inhabit both continental shelf edge and deep offshore waters, including off the west coast of

Scotland/*Alba* (Murphy *et al.*, 2019). Common dolphin diet is varied, and includes a variety of fish species, cephalopods and crustaceans. Over 16 species of fish are known to make up common dolphin diet including cod, herring, mackerel and lantern fish Myctophidae (Braulik *et al.*, 2021; Brophy *et al.*, 2009). Common dolphins generally travel in groups of up to 30 individuals, with super-pods being recorded over the summer months, where hundreds of dolphins travel together (HWDT, 2018).

13.6.1.39 Common dolphins have an estimated calving interval of 4 years, and it has been suggested that females may give birth to only 4 or 5 calves throughout their lifetime (Murphy *et al.*, 2009).

13.6.1.40 Common dolphin is a species of least concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (Braulik *et al.*, 2021; JNCC, 2019c).

13.6.1.41 The designation of MPAs is not required for common dolphin in Scottish waters. There are no protected areas within the marine mammal Study Area where common dolphins are listed as a primary feature or feature of interest. Common dolphins are, however, a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). Common dolphins are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.42 The estimated abundance of common dolphin in the Celtic and Greater North Seas MU is 102,656 (CV=0.29; 95% CI= 58,932-178,822), with an estimated 57,417 (CV=0.32; 95% CI= 30,850-106,863) within the UK portion of the MU (IAMMWG, 2023).

13.6.1.43 Within Scottish waters, common dolphins are present throughout the Hebrides/*Innse Gall* and within the marine mammal Study Area (Hartny-Mills *et al.,* 2024). They are generally considered a summer visitor to the west coast, with increased sightings observed between April and October, however some individuals are present year-round (HWDT, 2018). There is a change in distribution of common dolphin which is linked to seasonal movements, where they generally move into shelf waters during the summer months and move further offshore during the winter (MacLeod *et al.*, 2008). An increase in common dolphin sightings has previously been related to increasing sea temperatures (Weir *et al.*, 2009).

13.6.1.44 The estimated common dolphin abundance in SCANS-IV block CS-I is 5,888 (CV=0.886; 95% CI=30-19,262) (Gilles *et al.*, 2023). The comparable SCANS-III block J had an estimated abundance of 4,679 (CV=0.95; 95% CI=0-16,108), indicating an increase in estimated abundance from summer 2016-summer 2022 (Hammond *et al.*, 2021). No common dolphins were recorded within block CS-J of the SCANS-IV survey, or within block K of the SCANS-III surveys.

13.6.1.45 During 2023 ORCA surveys, common dolphins were recorded to the south and east of the Isle of Lewis/*Eilean Leòdhais*, with 0.1-4.5 sightings per 100 km throughout the Minches (ORCA, 2024).

13.6.1.46 Site-specific DAS for the Offshore Project recorded common dolphins throughout the Survey Area (**Appendix 13.1, Volume 2c**). During the first year of DAS, from March 2022-February 2023, common dolphins were recorded in March, September and February, with peak abundance in September of 257 (95% CI=30-606). Common dolphins were recorded during August, September, October and January during the second year of DAS (March 2023-February 2024), with an estimated peak abundance of 481 (95% CI-125=4-967) in January 2024.

13.6.1.47 No common dolphins were recorded during site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011, also along the northwest coast of the Isle of Lewis/*Eilean Leòdhais*.

13.6.1.48 During PAM surveys, the overall presence of common dolphins was low. Detections were observed on 60 days between January 2024-February 2025, which accounted for just 17% of the monitoring period. There were no seasonal patterns observed in their occurrence. However, detections remained relatively constant with species being recorded on 1-2 days per week. Increased detections were recorded during July, August and October at Site 1 (SW), to a maximum of 4 days per week (**Appendix 13.2, Volume 2c**).

Density

13.6.1.49 SCANS-IV surveys carried out in 2022 estimated density at 0.1678 (CV=0.886) animals/km² within block CS-I (Gilles *et al.*, 2023). In comparison, the previous SCANS-III survey estimated a lower common dolphin density at 0.133 within the corresponding block J (Hammond *et al.*, 2021). No common dolphins were recorded within block CS-J during the SCANS-IV survey, or within the corresponding block K during the SCANS-III surveys. Modelled density surface estimates of SCANS-III data estimated common dolphin density at 0.00-0.07 animals/km² in the vicinity of the Offshore Project and throughout the Hebrides (**Figure 13.5, Volume 2b**; Lacey *et al.*, 2022). This is a decrease in estimated density compared to the previously modelled data from 2005/07, which estimated common dolphin density at 0.07-0.15 animals/km² in the vicinity of the Offshore Project. These estimates also suggest higher densities to the south of Lewis and Harris/*Leòdhas agus Na Hearadh* and waters off the southwest of Scotland/*Alba*, of 0.15-0.30 animals/km² (Lacey *et al.*, 2022).

13.6.1.50 The first year of site-specific DAS for the Offshore Project estimated that the peak density for common dolphin was 0.27 individuals/km², observed in September 2022. Of the months where common dolphins were recorded, the lowest density estimate was during February 2023, with an estimate of 0.08 individuals/km² (**Appendix 13.1, Volume 2c**). The peak density during the second year was 0.50 individuals/km² in January 2024, and the lowest density month where common dolphins were recorded was during August 2023, which had a density estimate of 0.06 individuals/km².

Bottlenose dolphin

Ecology and Conservation

13.6.1.51 Bottlenose dolphins are present in tropical and temperate seas throughout the northern and southern hemisphere. Within Scottish waters, 2 ecotypes exist: a coastal, inshore population, and an offshore pelagic population (Louis *et al.*, 2014). They have a generalist diet and feed on a variety of benthic and pelagic fish, cephalopods and shellfish (HWDT, 2018; Reid *et al.*, 2003). The species recorded in stomach content analysis of bottlenose dolphins stranded in Scotland/*Alba* were primarily cod, saithe *Pollachius virens* and whiting, in addition to lesser quantities of other species including salmon *Salmo salar*, haddock and cephalopods (Santos *et al.*, 2001). Bottlenose dolphins are generally recorded in groups sizes of between 3-10 individuals and have been observed feeding co-operatively where individuals work together to herd fish to the surface (HWDT, 2018).

13.6.1.52 Bottlenose dolphin calving intervals are between 2-6 years, and they have a gestation period of approximately 12 months (Wells *et al.*,1999; Wells and Scott, 1999). Maternal investment and mother-calf associations are long-lasting and remain post-weaning, which typically occurs when the calf is 1.5-2 years old (Grellier *et al.*, 2003).

13.6.1.53 Bottlenose dolphin is a species of least conservation concern on the IUCN red list and has an unknown overall conservation status due to a lack of data on population trends, habitat availability and future prospects for the species (Wells *et al.*, 2019; JNCC, 2019d).

13.6.1.54 Bottlenose dolphin is listed under Annex II of the Habitats Directive as a species of Community Interest, which has been transposed into Scottish law through the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. This legislation requires the designation of SACs for the species. Bottlenose dolphins are not a qualifying feature or a primary reason for site designation for any SACs on the west coast of Scotland/*Alba*. Bottlenose dolphins are a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). Bottlenose dolphins are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.55 Bottlenose dolphins are present year-round on the west coast of Scotland/*Alba* including within the Marine Mammal Study Area. They are frequently recorded in and around the Sound of Barra and throughout the Inner Hebrides/*Na h-Eileanan a-staigh*most notably around the Isle of Skye/*An t-Eilean Sgitheanach* (HWDT, 2018; Hartny-Mills *et al.,* 2024). Bottlenose dolphins have been recorded in the waters north and west of the Isle of Lewis/*Eilean Leòdhais* (Hartny-Mills *et al.,* 2024). There are 2 distinct coastal ecotype populations present on the west coast of Scotland/*Alba* which both show long-term site fidelity. One population inhabits waters around the Sound of Barra in the Outer Hebrides/*Na h-Eileanan Sia*, which has an estimated population of between 6-15 individuals, mostly made up of females (Grellier and Wilson, 2003; van Geel, 2016). The other population, the

Inner Hebrides/*Na h-Eileanan a-staigh* Community, is wider ranging, with sightings recorded from the Kintyre/*Cinn Tìre* peninsula to the Isle of Skye/*An t-Eilean Sgitheanach*. This is a larger population, which is made up of approximately 30-40 individuals (HWDT, 2018; van Geel, 2016). There is also an offshore, transient population, in deeper water along the continental shelf edge to the west of Scotland/*Alba* (Hague *et al.*, 2020; van Geel, 2016). All these areas and their associated bottlenose dolphin populations fall within the Marine Mammal Study Area.

13.6.1.56 There are 2 MUs for bottlenose dolphin off the west coast of Scotland/*Alba*, representing coastal and offshore ecotypes. The estimated abundance of bottlenose dolphin in the Coastal West Scotland and the Hebrides MU is 45 (95% CI=33-66) (IAMMWG, 2023). The estimated abundance of bottlenose dolphin in the UK portion of the Oceanic Waters MU is 1,299 (95 % CI=597-2,826).

13.6.1.57 The SCANS-IV survey recorded bottlenose dolphins within block CS-I, with an abundance estimate of 14,208 (CV=0.473; 95% CI=104-29,117) (Gilles *et al.*, 2023). None were recorded within SCANS-IV block CS-J, or within SCANS-III blocks J and K (Gilles *et al.*, 2023; Hammond *et al.*, 2021).

13.6.1.58 During 2023 ORCA surveys, bottlenose dolphin had a sightings rate of 0-0.13 per 100 km throughout the Minches/*A' Mhaoil* and to the east of the Isle of Lewis/*Eilean Leòdhais* (ORCA, 2024).

13.6.1.59 Site-specific DAS for the Offshore Project only recorded bottlenose dolphins once during the first year. One individual was recorded within the survey area but not with the Array Area during July 2022. The abundance estimate for July was 9 (95% CI=1-26). Bottlenose dolphins were not recorded during the second year of site-specific surveys (**Appendix 13.1, Volume 2c**).

13.6.1.60 During site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 in proximity to the Offshore Project, no bottlenose dolphins were recorded (Royal Haskoning, 2012).

13.6.1.61 Bottlenose dolphins were the most regularly detected species during PAM surveys from January 2024-February 2025. Bottlenose dolphins were present on 140 days, which accounted for 39.8% of the monitoring period across all deployments at both monitoring locations. The number of days the species was detected on a weekly basis varied through time, but most detections were made during the winter months at Site 1 (SW) and at the end of the summer at Site 1 (SW) and Site 2 (NE) (**Appendix 13.2, Volume 2c**).

Density

13.6.1.62 Bottlenose dolphin density in SCANS-IV block CS-I is estimated at 0.4048 (CV=0.473) animals/km². Modelled density surface estimates of SCANS-III data estimated bottlenose dolphin density at 0.00-0.05 animals/km² in the vicinity of the Offshore Project and throughout the marine mammal Study Area (**Figure 13.6, Volume 2b**; Lacey *et al.*, 2022). The estimated density moving southwest of Lewis/*Leòdhais* is 0.025-0.05 animals/km² in the south of the Outer Hebrides/*Na h-Eileanan Sia*, in the region south of the Uists/*Uibhist*, around Barra/*Barraigh* and to the west of Mull/*Muile*, including Coll/*Cola* and Tiree/*Tiriodh*. This continues further south past Islay and the west of Arran/*Arainn*, and into the waters off Northern Ireland (Lacey *et al.*, 2022).

13.6.1.63 Bottlenose dolphins were only recorded during July 2022 during site-specific DAS, with an estimated density of 0.01 individuals/km^2 (**Appendix 13.1, Volume 2c**).

Risso's dolphin

Ecology and Conservation

13.6.1.64 Risso's dolphins are widespread and distributed throughout mid-temperate waters, with most sightings occurring in shelf and shelf-edge habitat (Hague *et al.*, 2020). Within Scottish waters, they primarily inhabit deep shelf regions and coastal areas with deep waters. Hotspots include the Shetland/*Sealtainn* Islands and the west coast of Scotland/*Alba*, particularly around the Isle of Lewis/*Eilean Leòdhais* (Hague *et al.*, 2020; Reid *et al.*, 2003).

13.6.1.65 Risso's dolphins are thought to forage at night and have a varied diet which predominantly consists of deep-water species, including cephalopods, benthic flatfish and schooling fish (Hartman, 2018; HWDT, 2018; MacLeod, 2014; Plint *et al.*, 2023).

13.6.1.66 Risso's dolphins have a gestation period of approximately 13-14 months, with a calving interval of 2.4 years (Hartman, 2018). Breeding is thought to occur year-round. Females reach sexual maturity at around 8-10 years, and males 10-12 years.

13.6.1.67 Risso's dolphin is a species of least concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (JNCC, 2019e; Kiszka and Braulik, 2018b).

13.6.1.68 The designation of MPAs is not a requirement for Risso's dolphin in Scottish waters, however they are listed as a protected feature within the North-east Lewis MPA, which covers waters to the east of the Isle of Lewis/*Eilean Leòdhais* within the Minch/*Mhaoil*. Risso's dolphins are a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). They are also listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA, and the Minches and the Sea of the Hebrides IMMA, with the latter identified as important for breeding (IUCN-MMPATF, 2024a; 2024b).

North-east Lewis MPA

13.6.1.69 The North-east Lewis MPA does not overlap with the Offshore Project, however, it does lie within the Marine Mammal Study Area. The conservation benefit of the North-east Lewis MPA to Risso's dolphin is protection in one of only two locations in the UK where they are recorded in high numbers (NatureScot, 2025a). In 2019, the Risso's dolphin feature, assessed at a site level, was considered to be 'favourable'. The conservation objectives of the site seek to conserve this condition. This means that:

- ‘*The species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;*
- *The extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered;*
- *The structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating*.

13.6.1.70 Site-specific advice on the ‘species is conserved’ element of the conservation objectives is that Risso’s dolphins in the North-east Lewis MPA should not be at significant risk from injury or killing. For the purposes of the MPA assessment, Risso’s dolphins are only protected from injury or killing when they are within the site. Any activities taking place within or outside the MPA that could kill or injure Risso’s dolphins within the MPA should be considered.

13.6.1.71 Site-specific advice on the ‘continued access…’ element of the conservation objectives is to conserve access to resources provided by the MPA for feeding, socialisation and breeding, and conserve the distribution of Risso’s dolphin within the site by avoiding significant disturbance. Reference is made to both physical barriers and disturbance.

13.6.1.72 Site-specific advice on the ‘extent and distribution…’ and ‘structure and function…’ elements of the conservation objectives is to conserve the extent and distribution of any supporting feature upon which Risso’s dolphin is dependent (e.g. squid and octopus prey), and conserve the structure and function of supporting features, including processes to ensure Risso’s dolphins are healthy and not deteriorating.

13.6.1.73 Consideration is given to the potential effects of the Offshore Project on the conservation objectives of the North-east Lewis MPA in the impact sections below, alongside the assessment of impacts on Risso’s dolphin.

Distribution and abundance

13.6.1.74 The estimated abundance of Risso’s dolphin in the Celtic and Greater North Seas MU is 12,262 (CV=0.46; 95% CI= 5,227-28,764), with an estimated 8,687 (CV=0.63; 95% CI= 2,810-26,852) within the UK portion on the MU (IAMMWG, 2023).

13.6.1.75 Risso’s dolphins are present throughout the west coast of Scotland/*Alba* and the marine mammal study area year-round, with frequent sightings within the Inner Hebrides and around the Isle of Skye/*An t-Eilean Sgitheanach*, situated within the marine mammal study area. The highest encounter rates occur in the north of the Outer Hebrides/*Na h-Eileanan Sia*, particularly around the Butt of Lewis/*Rubha Robhanais* approximately 25 km north-east of the Array Area, which is a known foraging area due to the important sandeel spawning ground (Hartny-Mills *et al.,* 2024; HWDT, 2018; Weir *et al.*, 2019). Risso’s dolphins are known to show high levels of site fidelity, where they return to the same areas year on year (Weir *et al.,* 2019. There is a seasonal increase in sightings between May-October (Hague *et al.*, 2020; Weir *et al.*, 2019).

13.6.1.76 Within SCANS-IV block CS-J Risso's dolphins have an estimated abundance of 936 (CV=0.649; 95% CI=7-2,319) (Gilles *et al.*, 2023). No abundance estimate is available for block CS-I. Within SCANS-III block J, Risso's dolphins have an abundance estimate of 675 (CV=0.80; 95% CI=0-19,557) (Hammond *et al.*, 2021). Block K has an abundance estimate at 440 (CV=0.76; 95% CI=0-1,222), which is lower than the current estimate within the respective block CS-J.

13.6.1.77 During 2023 ORCA surveys, Risso's dolphins were recorded within the Study Area with 0-0.03 sightings per 100 km in the Minches (ORCA, 2023).

13.6.1.78 Site-specific DAS for the Offshore Project recorded Risso's dolphin during the first year, in March, April and June 2022. Peak occurrence occurred in June, with an abundance estimate of 93 (95% CI=11-280). During the second year of DAS, Risso's dolphins were only recorded in July 2023, which had an abundance estimate of 22 (95% CI=3-65) (**Appendix 13.1, Volume 2c**).

13.6.1.79 During site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 in proximity to the Offshore Project, Risso's dolphins were recorded at both vantage point sites. Risso's dolphins were observed from March-August 2011 (Royal Haskoning, 2012).

13.6.1.80 Risso's dolphins were the least frequently detected delphinid species during PAM surveys from January 2024-February 2025. Risso's dolphins were detected on 41 days throughout all deployments, which accounted for 11.6% of the monitoring period. The number of days within a week in which Risso's dolphins were detected was generally low, although an increase in their occurrence at Site 1 (SW) was recorded in August and September 2024 in comparison to other months (**Appendix 13.2, Volume 2**).

Density

13.6.1.81 The area identified as having the highest Risso's dolphin density is the area north of the Isles of Lewis/*Eilean Leòdhais* and Harris/*Na Hearadh* within the North-east Lewis MPA, which has higher than average densities compared to other Scottish territorial waters (Paxton *et al.*, 2014), hence its designation.

13.6.1.82 Within block CS-J of the SCANS-IV survey, Risso's dolphin had an estimated density of 0.0288 (CV=0.649) animals/km^2 (Gilles *et al.*, 2023). This is an increase on the comparative block K of the SCANS-III survey which had a Risso's dolphin density of 0.014 (CV=0.76) animals/km^2 (Hammond *et al.*, 2021). No density estimate is available for block CS-I (Gilles *et al.*, 2023). SCANS-III block J had an estimated density of 0.192 (CV=0.80) animals/km^2. No modelled density surface estimates of SCANS-III data are available for Risso's dolphin (Lacey *et al.*, 2022).

13.6.1.83 The first year of site-specific DAS for the Offshore Project estimated that the peak density for Risso's dolphin occurred in June 2022, with a density of 0.10 individuals/km². Of the months where Risso's dolphins were recorded, the lowest density estimate was during April, with an estimate of 0.01 individuals/km² (**Appendix 13.1, Volume 2c**). During the second year of surveys, Risso's dolphins were only observed in July 2023, which had an estimated density of 0.02 individuals/km² (**Appendix 13.1, Volume 2c**).

Atlantic white-sided dolphin

Ecology and Conservation

13.6.1.84 Atlantic white-sided dolphins are endemic to the North Atlantic, primarily inhabiting cold-temperate and sub-polar waters of continental shelf and slope habitats (Calderan, 2021). White-sided dolphin diet consists of a variety of fish, from both shelf and oceanic waters, including mackerel, poor cod *Trisopterus minutus*, pouting *T. luscus*, blue whiting *Micromesistius poutassou*, whiting, and silvery pout *Gadiculus argenteus thori* (Hernandez-Millan *et al.*, 2015). White-sided dolphin group size is variable and can range from a few individuals to large aggregations of hundreds of animals (Calderan, 2021; Gilles *et al.*, 2023; Pugliares-Bonner *et al.*, 2021).

13.6.1.85 Atlantic white-sided dolphins have a gestation period of 10-11 months, with mating occurring in late summer and the birth period occurring in late spring to early summer (Evans and Smeenk, 2008). They have a lactation period of 18 months and a calving interval of 2-3 years (Evans and Smeenk, 2008).

13.6.1.86 Atlantic white-sided dolphin is a species of least concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (Braulik, 2019; JNCC, 2019f).

13.6.1.87 The designation of MPAs is not required for Atlantic white-sided dolphin in Scottish waters. There are no protected areas where white-sided dolphins are listed as a primary feature or feature of interest within the Marine Mammal Study Area. Atlantic white-sided dolphin is listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (IUCN-MMPATF, 2024a).

Distribution and abundance

13.6.1.88 Atlantic white-sided dolphins are present within the Marine Mammal Study Area , inhabiting continental shelf edge and deep ocean habitats (Hernandez-Millan *et al.*, 2015; Reid *et al.*, 2003). Their distribution includes the west coast of Scotland/*Alba* where there is a seasonal inshore movement during the summer months (Hague *et al.*, 2020; Hernandez-Millan *et al.*, 2015; HWDT, 2018). Records of white-sided dolphin exist in coastal waters within the marine mammal study area, primarily to the northeast of the Isle of Lewis/*Eilean Leòdhais*, north of the Isle of Skye/*An t-Eilean Sgitheanach* and in sea lochs along the west coast of mainland Scotland/*Alba* (Hauge *et al.*, 2020).

13.6.1.89 The estimated abundance of Atlantic white-sided dolphin in the Celtic and Greater North Seas MU is 18,128 (CV=0.61; 95% CI= 6,049-54,323) with an estimated 12,293 (CV=0.64;) 3,891-38,841 within the UK portion on the MU (IAMMWG, 2023).

13.6.1.90 The most recent SCANS-IV survey recorded no Atlantic white-sided dolphins within block CS-I. Within block CS-J there is an estimated abundance of 756 (CV=0.737; 95% CI=8-2,087). No Atlantic white-sided dolphins were recorded within blocks J and K of the SCANS-III surveys (Hammond et al., 2021).

13.6.1.91 During 2023 ORCA surveys, no Atlantic white-sided dolphins were recorded along survey routes within the marine mammal Study Area (ORCA, 2024).

13.6.1.92 No Atlantic white-sided dolphins were recorded during site-specific DAS for the Offshore Project (**Appendix 13.1, Volume 2c**).

13.6.1.93 No Atlantic white-sided dolphins were recorded during site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 in proximity to the Offshore Project (Royal Haskoning, 2012).

13.6.1.94 Atlantic white-sided dolphins were detected during PAM surveys on 100 days from January 2024-February 2025, across all deployments, which accounted for 28.4% of the monitoring period. On a weekly basis, the number of days the species was detected was highest at the start of Deployment 1 in January 2024, near the end of Deployment 2 at the end of August and start of September 2024 and at the end of Deployment 3 in February 2025, with both mooring locations showing a similar pattern when information was available at both sites (**Appendix 13.2, Volume 2**).

Density

13.6.1.95 Atlantic white-sided dolphins have an estimated density within SCANS-IV block CS-J of 0.0233 (CV=0.737) animals/km². No modelled density estimates are available for white-sided dolphin from previous SCANS surveys (Lacey *et al.*, 2022).

13.6.1.96 No density estimates are available for white-sided dolphin during site-specific DAS for the Offshore Project (**Appendix 13.1, Volume 2c**).

Long-finned pilot whale

Ecology and Conservation

13.6.1.97 Long-finned pilot whale occurs throughout the marine mammal Study Area where they are usually present in deep waters further offshore (Hague *et al.*, 2020; Reid *et al.*, 2003). The bulk of long-finned pilot whale diet is made up of oceanic cephalopods, with Ommastrephid squid being the most important prey in Scotland/*Alba* (Santos *et al.*, 2013). They also feed on schooling fish and crustaceans (Reid *et al.*, 2003). Long-finned pilot whales are usually found in large groups, with groups of more than 1,000 individuals having been recorded in some regions (Pollock *et al.*, 2000; Reid *et al.*, 2003).

13.6.1.98 Breeding can occur year-round, however peak conception is likely in April and the summer months (Reid *et al.*, 2003). Gestation lasts approximately 12 months, with calves lactating for up to 4 years.

13.6.1.99 Long-finned pilot whale is a species of least conservation concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects (JNCC, 2019g; Minton *et al.*, 2018).

13.6.1.100 The designation of MPAs is not required for pilot whales in Scottish waters and there are no protected areas where pilot whales are listed as a primary feature or feature of interest within the marine mammal Study Area. Long-finned pilot whales are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (IUCN-MMPATF, 2024a).

Strandings

13.6.1.101 Pilot whales are the species most prone to mass strandings and have been recorded on multiple occasions stranded along Scottish coastlines (Brownlow *et al.*, 2020). On 16th July 2023, 55 long-finned pilot whales stranded at Traigh Mhor in North Tolsta/*Tolastadh bho Thuath* on the Isle of Lewis/*Eilean Leòdhais*, which is one of the UK's largest fatal mass strandings on record (Brownlow *et al.*, 2024). The cause of death was suspected to be a result of the family group following 1 female ashore, who had recently given birth (BDMLR, 2025).

Distribution and abundance

13.6.1.102 Long-finned pilot whales are present within the marine mammal study area, with waters to the north of Scotland/*Alba* having one of the largest population numbers within this northwest European distribution (Reid *et al.*, 2003). Their distribution is likely linked to prey availability and includes the west coast of Scotland/*Alba*, where they have been recorded in both near-shore and offshore waters, including to the northeast and west of the Isle of Lewis/*Eilean Leòdhais* (HWDT, 2024). In UK waters sightings peak over the winter months (Reid *et al.*, 2003).

13.6.1.103 There are currently no MUs for long-finned pilot whales within UK and Irish waters (IAMMWG, 2023).

13.6.1.104 The most recent SCANS-IV survey provides a pilot whale abundance estimate within block CS-I of 93 (CV=1.240; 95% CI=5-1,788; Gilles *et al.*, 2023). This is an increase compared to the previous SCANS-III survey block J, which had an estimated pilot whale abundance of 79 (CV=1.06; 95% CI=10-641). No pilot whales were recorded within SCANS-IV block CS-J (Gilles *et al.*, 2023). SCANS-III block K had an estimated abundance of 1,733 (CV=1.06; 95% CI=271-11,084) (Hammond *et al.*, 2021).

13.6.1.105 During 2023 ORCA surveys, no long-finned pilot whales were recorded along survey routes within the marine mammal Study Area (ORCA, 2024).

13.6.1.106 No long-finned pilot whales were recorded during site-specific DAS for the Offshore Project, nor for the Oyster Wave Array site-specific surveys, which took place from September 2010-September 2011 (**Appendix 13.1, Volume 2c**; Royal Haskoning, 2012).

13.6.1.107 During PAM surveys, long-finned pilot whales were detected on 53 days throughout all deployments from January 2024-February 2025, which accounted for 15.1% of the monitoring period. The number of days per week where detections occurred was generally low, with increased presence at Site 1 (SW) during the first partially monitored week in January 2024, during 2 weeks in August 2025 and at the end of deployment 3 in February 2025. At Site 2 (NE), detections were consistently low throughout the survey period between May-September 2024 (**Appendix 13.2, Volume 2c**).

Density

13.6.1.108 Within block CS-I of the SCANS-IV surveys, pilot whales have an estimated density of 0.0026 (CV=1.240) animals/km². Block J of the SCANS-III survey had a density estimate of 0.002 (CV=1.16) animals/km² and block K had an estimated density of 0.053 (CV=1.06) animals/km² (Hammond *et al.*, 2021). Modelled density surface estimates of SCANS-III data estimates pilot whale density at 0.00-0.55 animals/km² within the marine mammal Study Area, with SCANS-II/CODA data estimating pilot whale density at 0.0-0.1 animals/km². Within the vicinity of the Offshore Project, the density estimate is 0.00-0.05 animals/km², however in the north-west of the Study Area the density increases to a maximum estimation of 0.45-0.55 animals/km² (**Figure 13.7, Volume 2b**; Lacey *et al.*, 2022).

Killer whale (Orca)

Ecology and Conservation

13.6.1.109 Killer whales are the largest member of the delphinids, with a distribution which spans from tropical, equatorial waters to the polar waters of the Arctic and Antarctic (HWDT, 2018; Jourdain *et al.*, 2019). Within Scotland/*Alba*, 2 killer whale ecotypes are present, namely the Northern Isles Community and the West Coast Community. Both groups are known to inhabit coastal, near-shore waters and deep, offshore habitats (HWDT, 2018).

13.6.1.110 The Northern Isles Community is a transient population, which travels between the north of Scotland/*Alba* and eastern Iceland, with mark-recapture studies recording individual movements between regions (Foote *et al.*, 2010). Within the northern North Sea, killer whales are regularly recorded feeding on mackerel and herring around trawlers, hunting seals in the Northern Isles of Scotland/*Alba* and foraging for herring in Icelandic waters, where they are associated with summer spawning events (Robinson *et al.*, 2017). The Northern Isles Community are often recorded in large family groups, however, can be sighted in small numbers or alone (Robinson *et al.*, 2017).

13.6.1.111 The West Coast Community are a smaller population of killer whales that continues to reduce in numbers. They are only recorded within UK and Irish waters, where they are present year-round (Scullion *et al.*, 2021). Killer whales in this community prey on cetaceans including harbour porpoises and minke whales. The remaining 2 animals in this population are generally recorded together, however are sometimes sighted alone (HWDT, 2018).

13.6.1.112 Killer whales have a gestation period of approximately 17 months, with calving occurring between March and April (Luque et al., 2006). Within the West Coast Community, no births have ever been recorded, despite past females of the group being of reproductive age (Scullion et al., 2021).

13.6.1.113 Killer whales are listed as a species which is data deficient on the IUCN red list and have an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and prospects (JNCC, 2019h; Reeves et al., 2017).

13.6.1.114 The designation of MPAs is not required for killer whales in Scottish waters. There are no protected areas where killer whales are listed as a primary feature or feature of interest within the marine mammal Study Area. Killer whales are, however, a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). They are also listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and The Minches and the Sea of the Hebrides IMMA (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.115 Killer whales are recorded occasionally on the west coast of Scotland/*Alba* within the marine mammal study area (Hartny-Mills *et al.,* 2024; HWDT, 2018; SeaWatch Foundation, 2024). Sightings are predominantly in near-shore coastal waters(HWDT, 2018; HWDT, 2024; Hartny-Mills *et al.,* 2024). Sightings in the Outer Hebrides/*Na h-Eileanan Sia* are occasional, with records showing killer whale presence in the north and west of the Isle of Lewis/*Eilean Leòdhais*, particularly around the Butt of Lewis/*Rubha Robhanais*, in proximity to the Offshore Project (HWDT, 2024). Killer whale distribution is likely determined by prey abundance, with the Northern Isles Community present year-round in the north of Scotland/*Alba*, with sightings peaking during the summer months, correlating with harbour seal pupping season (Bolt *et al.*, 2009; Robinson *et al.*, 2017).

13.6.1.116 The West Coast Community is mainly recorded in the Hebrides and the west coast of Scotland/*Alba*, however sightings on the east coast of Scotland/*Alba*, Ireland, West Wales, and Cornwall and the Isles of Scilly have been reported (Scullion *et al.*, 2021). They are most commonly recorded in waters around the Isles of Mull/*Muile* and Skye/*An t-Eilean Sgitheanach* (Bolt *et al.*, 2009; HWDT, 2018). There were originally 10 individuals catalogued by the Hebridean Whale and Dolphin Trust. However, since 2001, only 8 individuals have been recorded, and in recent years only 2 males, John Coe (W01) and Aquarius (W08), have been sighted (HWDT, 2018; Scullion *et al.*, 2021). This, combined with 2016 strandings information for a female (Lulu, W06), suggests this population is in decline (Beck *et al.*, 2014).

13.6.1.117 Studies on abundance and distribution of killer whales are limited. There are currently no MUs for killer whales within UK and Irish waters, and there are no abundance estimates available from SCANS-IV or SCANS-III surveys due to low sightings rates (Gilles *et al.*, 2023; Hammond *et al.*, 2021; IAMMWG, 2023).

13.6.1.118 During 2023 ORCA surveys, no killer whales were recorded along survey routes within the marine mammal Study Area (ORCA, 2024).

13.6.1.119 Site-specific DAS for the Offshore Project recorded 6 killer whales during January 2023 within the first year of surveys (**Appendix 13.1, Volume 2c**). They were recorded near the centre of the Offshore Project's Array Area and had an estimated abundance of 60 (95% CI=7-172). No killer whales were recorded during site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 (Royal Haskoning, 2012).

13.6.1.120 Killer whales were identified in PAM surveys for each of the monitored months from January 2024-February 2025. The species was identified on 50 days across the survey period, which accounted for 14.2% of the monitoring period. During this time, detections occurred on up to 4 days per week. There were no clear patterns in their occurrence, with both Site 1 (SW) and Site 2 (NE) showing similar patterns in detections (**Appendix 13.2, Volume 2**).

Density

13.6.1.121 Studies focusing on killer whale density in the North Atlantic are limited, and there are currently no density estimates for killer whales on the west coast of Scotland/*Alba*. No density estimates are available for killer whales from SCANS-IV or SCANS-III surveys (Gilles *et al.*, 2023; Hammond *et al.*, 2021; Lacey *et al.*, 2022).

13.6.1.122 Site-specific DAS for the Offshore Project estimated density within the Survey Area to be 0.06 individuals/km^2 during January 2023 (**Appendix 13.1, Volume 2c**).

Beaked whale species

Ecology and Conservation

13.6.1.123 Beaked whales make up the family Ziphiidae, which consists of 24 recognised species, 6 of which have been recorded in northwest Europe (Alves *et al.*, 2023; MacLeod, 2018). These are the northern bottlenose whale *Hyperoodon ampullatus*, and Sowerby's *Mesoplodon bidens*, True's *M. mirus*, Cuvier's *Ziphius cavirostris*, Gervais's *M. europaeus* and Blainville's *M. densirostris* beaked whales (Boisseau *et al.*, 2021; Reid *et al.*, 2003; Ó Cadhla *et al.*, 2004). Beaked whales are widely distributed, with some species occurring throughout the world's oceans, with some speculation as to whether species partake in seasonal migrations or inshore/offshore movements, however there is currently little evidence of such movements (Alves *et al.*, 2023). Beaked whales forage throughout the day, likely on benthic species due to observed marks on the seabed (Woodside *et al.*, 2006). Beaked whales partake in prolonged deep dives of several thousand metres where they forage for squid, fish and invertebrates (MacLeod, 2018). Beaked whales usually occur in groups of 4-10 individuals.

13.6.1.124 Beaked whales in the northern hemisphere have a gestation period of approximately 12 months and give birth to a single calf every 2-4 years. It has been suggested for some species that lactation occurs for up to the first 4 years of a calf's life (Alves *et al.*, 2023; Baird, 2019; Feyrer *et al.*, 2020).

13.6.1.125 The species of beaked whale with a distribution which covers UK waters are either listed as being near threatened or are a species of least concern on the IUCN red list and have no available conservation status due to insufficient or no data availability (JNCC, 2019i; Lacey and Hammond, 2023).

13.6.1.126 The designation of MPAs is not required for beaked whales in Scottish waters. There are no protected areas where any beaked whale species is listed as a primary feature or feature of interest within the marine mammal Study Area. Northern bottlenose whales are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (IUCN-MMPATF, 2024a).

Distribution and abundance

13.6.1.127 Beaked whales have a primarily oceanic distribution and prefer deep continental slope habitats beyond shelf edges. They are not regularly recorded in UK waters with the majority of records existing on the Atlantic Frontier, specifically the Rockall Trough, Wyville-Thompson Ridge and the Faroe-Shetland Channel, which has been identified as a beaked whale global hotspot (MacLeod and Mitchell, 2006). Northern bottlenose whales are the most regularly recorded beaked whale species in waters off the west coast of Scotland/*Alba*, and it has been proposed that animals may pass through the marine mammal Study Area along migratory routes in late summer/early autumn and late winter/early spring (Macleod *et al.*, 2004; MacLeod and Mitchell, 2006). Beaked whales, most notably northern bottlenose whales, have been recorded throughout the Hebrides, with the majority of sightings occurring in the south of the Hebrides and within deep sea lochs along the west-coast mainland (HWDT, 2024). Despite the coastal nature of some sightings, the Hebrides offers a range of deep oceanographic features in near-shore environments, which beaked whales may utilise. Strandings of beaked whales have occurred throughout the Hebrides, and such occurrences provide valuable information on ecology and distribution (MacLeod *et al.*, 2004; SMASS, 2024). It is, however, difficult to produce abundance estimates for beaked whale species due to their illusive nature, their offshore, deep-water habitat preference and their prolonged diving behaviour (Barlow, 1999).

13.6.1.128 There are currently no MUs for beaked whales within UK and Irish waters (IAMMWG, 2023). Within SCANS-IV block CS-I beaked whales have an estimated abundance of 132 (CV=1.227; 95% CI=7-2,662) (Gilles *et al.*, 2023). No beaked whales were recorded within block CS-J. Within SCANS-III block J, beaked whales had an estimated abundance of 325 (CV=0.621; 95% CI=91-1,163) and an estimated abundance of 211 (CV=0.904; 95% CI=41-1,091) within block K (Hammond *et al.*, 2021).

13.6.1.129 During 2023 ORCA surveys, no beaked whale species were recorded along survey routes within the marine mammal Study Area (ORCA, 2024).

13.6.1.130 Beaked whale species were not recorded during site-specific DAS for the Offshore Project, nor for site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 (**Appendix 13.1, Volume 2c**; Royal Haskoning, 2012).

Density

13.6.1.131 Within SCANS-IV block CS-I beaked whales have an estimated density of 0.0038 (CV= 1.227) animals/km². The comparable SCANS-III block J had an estimated density of 0.009 (CV=0.621) animals/km². SCANS-III block K had an estimated beaked whale density of 0.006 (CV=0.904) animals/km² (Gilles *et al.*, 2023; Hammond *et al.*, 2021). Modelled density surface estimates of SCANS-III data provided a beaked whale density estimate of 0.00-0.05 animals/km² within the Study Area and throughout the Hebrides (**Figure: 13.8, Volume 2b**; Lacey *et al.*, 2022). Higher areas of density >0.1 animals/km² are estimated in the far offshore region off the northwest of Scotland/*Alba* (Lacey *et al.*, 2022).

Minke whale

Ecology and Conservation

13.6.1.132 Minke whales are the smallest and most common baleen whales in UK waters and are present throughout the northern hemisphere within tropical, temperate and polar seas (Reid *et al.*, 2003). Throughout their range, 3 geographical populations have been identified including a western stock from west Greenland, a central stock from east Greenland and Iceland, and an eastern stock from Norway, Spitsbergen, and the Barent and North Seas (Reid *et al.*, 2003; Tiedemann *et al.*, 2014). Minke whales have a generalist diet and take a wide range of fish including herring, sandeel, sprat, haddock, whiting and saithe (HWDT, 2018; Macleod *et al.*, 2004; Pierce *et al.*, 2004; Reid *et al.*, 2003). Minke whales are usually seen alone or in small groups of 2-3 individuals, with large aggregations having been observed in the Hebrides/*Na h-Eileanan Sia* at productive feeding grounds (HWDT, 2018). Lunge feeding behaviour, where baleen whales move suddenly towards the surface and engulf large quantities of water and prey, is often observed and minke whales are commonly seen foraging in association with seabirds.

13.6.1.133 Minke whale breeding grounds are generally at lower latitudes, however young calves have been recorded in spring and summer in temperate British and Irish waters, including the west coast of Scotland/*Alba*, leading to speculation on whether some mothers calve in regions of higher latitude (Anderwald and Evans, 2007; Kavanagh *et al.*, 2018). Conception is believed to occur over the winter months from October-March, with a gestation period of approximately 10 months and a calving interval of between 1-2 years (Lockyer, 1981; Lockyer,1984; Sergeant, 1963). Weaning occurs at between 4-6 months (Sergeant, 1963).

13.6.1.134 Minke whale is a species of least concern on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (Cooke, 2018a; JNCC, 2019j).

13.6.1.135 The designation of MPAs is not a requirement for minke whale in Scottish waters, however they are listed as a feature of interest within the Sea of the Hebrides MPA, which is approximately 92 km from the Array Area and covers waters from the west of Mull/*Muile* and Skye/*An t-Eilean Sgitheanach*, the Sea of the Hebrides, east of the Outer Hebridean/*Na h-Eileanan Sia* Islands to the Little Minch in the north. Minke whales are a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). They are also listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA (IUCN-MMPATF, 2024a; 2024b).

Sea of the Hebrides MPA

13.6.1.136 The Sea of the Hebrides MPA does not overlap with the Offshore Project but its northern extent does lie within the marine mammal Study Area. The conservation benefit of the Sea of the Hebrides MPA to minke whale is protecting high densities compared to other parts of Scottish territorial waters, particularly during the months of April-October (NatureScot, 2025b). In 2019, the minke whale feature, assessed at a site level, was considered to be ‘favourable’. The conservation objectives of the site seek to conserve this condition. This means that:

- *‘The species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;*
- *The extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered;*
- *The structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating.’*

13.6.1.137 Site-specific advice on the ‘species is conserved’ element of the conservation objectives is that minke whales in the Sea of the Hebrides MPA should not be at significant risk from injury or killing. For the purposes of the MPA assessment, minke whales are only protected when they are within the site. Any activities taking place within or outside the MPA that could kill or injure minke whales within the MPA should be considered.

13.6.1.138 Site-specific advice on the ‘continued access…’ element of the conservation objectives is to conserve access to resources (e.g. for feeding) provided by the MPA for various life stages of the minke whale life cycle, and conserve the distribution of minke whales within the site by avoiding significant disturbance. Reference is made to both physical barriers and disturbance.

13.6.1.139 Site-specific advice on the 'extent and distribution…' and 'structure and function…' elements of the conservation objectives is to conserve the extent and distribution of any supporting feature upon which minke whale is dependent (e.g. pelagic shoaling fish, including sandeel, prey), and conserve the structure and function of supporting features, including processes to ensure minke whales are healthy and not deteriorating.

13.6.1.140 Consideration is given to the potential effects of the Offshore Project on the conservation objectives of the Sea of the Hebrides MPA in the impact sections below, alongside the assessment of impacts on minke whale.

Distribution and abundance

13.6.1.141 The estimated abundance of minke whale in the Celtic and Greater North Seas MU is 20,118 (CV=0.18; 95% CI= 14,061-28,786), with an estimated 10,288 (CV=0.26; 95% CI= 6,210-17,042) within the UK portion on the MU (IAMMWG, 2023).

13.6.1.142 Within their North Atlantic distribution, minke whales are present within the marine mammal Study Area on the west coast of Scotland/*Alba* year-round with sightings increasing over the summer months between April-October (Kavanagh *et al.*, 2018; Robinson *et al.*, 2007; Hartny-Mills *et al.*, 2024). This seasonal increase in sightings is attributed to seasonal migrations from low latitude breeding areas up to higher latitude summer foraging grounds (Kavanagh *et al.*, 2018; Robinson *et al.*, 2007). Minke whale distribution throughout the west coast of Scotland/*Alba* is dependent on prey distribution, with increases in minke whale abundance linked to sandeel fisheries in June, and pre-spawning herring habitat in July and August (Macleod *et al.*, 2004). Most records of minke whales are in coastal waters of less than 200 m, but the species has also been recorded further offshore in deep-water habitat (HWDT, 2018; Gilles *et al.*, 2023). The highest summer sighting rates within the marine mammal Study Area are in the northern Minch around Tiumpan Head and northern Sea of the Hebrides (Hartny-Mills *et al.*, 2024).

13.6.1.143 Within SCANS-IV block CS-I minke whales have an estimated abundance of 1,038 (CV=0.731; 95% CI=3-3,759) (Gilles *et al.*, 2023). The comparative SCANS-III block J had an estimated minke whale abundance of 647 (CV=1.04; 95% CI=9-2,994) (Hammond *et al.*, 2021). Within SCANS-IV block CS-J minke whales have an estimated abundance of 718 (CV=00.545; 95% CI=174-1,857). The comparative SCANS-III block K had an estimated abundance of 295 (CV=0.81 (95% CI=0-994) (Hammond *et al.*, 2021).

13.6.1.144 During 2023 ORCA surveys minke whales were recorded throughout the Minches/*A' Mhaoil*, with a maximum of 2.71-16.22 sightings per 100 km in coastal waters to the east of Lewis/*Na Hearadh*. The rest of the Minch/*A' Mhaoil* had 0.22-1.66 minke whale sightings per 100 km (ORCA, 2024).

13.6.1.145 Site-specific DAS for the Offshore Project recorded minke whale once in the south of the 10 km buffer during July 2023. This gave an abundance estimate of 9 (95% CI=1-35).

13.6.1.146 During site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011 in proximity of the Offshore Project, minke whales were recorded on 2 occasions up to 1.5 km offshore in April, June and October but not within the Oyster Wave Array site boundary (Royal Haskoning, 2012).

13.6.1.147 Minke whales were predominantly detected over spring, summer and autumn months from April-November during PAM surveys carried out between January 2024 and February 2025. Minke whales were detected on 95 days, which accounted for 27% of the monitoring period. Seasonal presence revealed a bi-modal pattern, with peaks in their weekly occurrence in April-May and September-November. Although generally not recorded outside of this main window, minke whales were also detected in January and February in 2024 and 2025 at Site 1 (SW). Minke whale presence varied on a weekly basis, with detections ranging from 0-7 days per week (**Appendix 13.2, Volume 2**).

Density

13.6.1.148 Observed adjusted relative densities of minke whale between 2000 and 2012 throughout Scottish waters estimated minke whale density to be between 0 and 0.5 animals/km² in the vicinity of the Offshore Project (Paxton *et al.*, 2014). The highest minke whale density estimate within the marine mammal Study Area was >10 animals/km², occurring in a small area off the northwest of North Uist/*Uibhist a Tuath* and in the north of the Minch/*A' Mhaoil* (Paxton *et al.*, 2014).

13.6.1.149 Within SCANS-IV block CS-I minke whales have an estimated density of 0.0296 (CV=0.731) animals/km². The comparable SCANS-III block J had an estimated minke whale density of 0.018 (CV=1.04) animals/km². Within SCANS-IV block CS-J minke whales have an estimated density of 0.0221 (CV=0.545), a higher estimate than the SCANS-III comparable block K which had an estimated density of 0.009 (CV=0.81) animals/km² (Gilles *et al.*, 2023; Hammond *et al.*, 2021). Modelled density surfaces from SCANS-III data provided a minke whale density of 0.00-0.05 animals/km² within the vicinity of the Offshore Project and the wide marine mammal study area (**Figure 13.9, Volume 2b**; Lacey *et al.*, 2022). Previously modelled survey data from 2005/07, estimated minke whale density at 0.00-0.02 animals/km² in the vicinity of the Offshore Project, with patches of higher densities throughout the Hebrides up to 0.01-0.02 animals/km².

13.6.1.150 Site-specific DAS for the Offshore Project recorded minke whale during July 2023, which had a density estimate of 0.01 individuals/km².

Humpback whale

Ecology and Conservation

13.6.1.151 Humpback whales are widely distributed throughout the world's oceans, where they travel thousands of miles from breeding and mating grounds in warm, tropical waters to the cold feeding grounds of the polar regions (HWDT, 2018; Pallin *et al.*, 2018). In the North Atlantic, humpback whales are present within Scottish waters when they pass through, along their migratory pathways.

Humpback whale diet varies seasonally and geographically, and within Scottish waters is composed of krill and small fish such as herring, sprat and mackerel (Cooke, 2018b; HWDT, 2018; Reid *et al.*, 2003). Humpback whales are usually seen alone or in small groups of up to 7 animals (HWDT, 2018).

13.6.1.152 Humpback whale breeding grounds are located at low latitudes in warm, equatorial waters, where they give birth to a single calf every 2.4 years (Clapham, 2000). They have a gestation period of approximately 11-12 months, with calves reaching weaning age at around 10-12 months old (Chittleborough, 1958). Mating also occurs at low latitudes (Smith and Pike, 2003). Humpback whales show high site fidelity to summer foraging grounds and winter breeding grounds.

13.6.1.153 Humpback whale is a species of least concern on the IUCN red list and has no available conservation status due to limited or insufficient new evidence on which to update this species since the previous reporting round (Cooke, 2018b; JNCC, 2019k).

13.6.1.154 The designation of MPAs is not a requirement for humpback whales in Scottish waters. There are no protected areas where humpback whales are listed as a primary feature or feature of interest within the marine mammal Study Area. Humpback whales are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (IUCN-MMPATF, 2024a).

Distribution and abundance

13.6.1.155 Humpback whales favour inshore and continental shelf waters, and travel through the open ocean during migration (HWDT, 2018). They are present within the marine mammal Study Area year-round in low numbers, with an increasing presence during the spring when they are travelling between breeding grounds off the coast of Africa to feeding grounds in Iceland and Norway (Berrow and Whooley, 2022; HWDT, 2018; van Geel *et al.*, 2022). Humpback whale sightings have increased on the west coast of Scotland/*Alba* in recent years.

13.6.1.156 Sightings of humpback whales have been recorded throughout the marine mammal Study Area, with most sightings occurring within the Minches/*Mhaoil* (HWDT, 2024; HWDT, 2018; SeaWatch Foundation, 2024). Sightings in the Outer Hebrides/*Na h-Eileanan Sia* are occasional, with records showing humpback whale presence to the north and east of the Isle of Lewis/*Eilean Leòdhais*. Few records exist in waters to the west of the Outer Hebrides/*Na h-Eileanan Sia* (HWDT, 2024; Reid *et al.*, 2003). Acoustic moorings deployed off the west coast of Scotland/*Alba* detected humpback whale vocalisations each year from January, with peaks in whale song in the months of spring, particularly March and April (Risch *et al.*, 2019; van Geel *et al.*, 2022). After May, humpback whale vocalisations became scarce or absent (van Geel *et al.*, 2022).

13.6.1.157 Humpback whales were historically targeted by commercial whalers in the Outer Hebrides/*Na h-Eileanan Sia*, with records showing that humpbacks were caught between 1905-1928. There is some evidence to suggest that humpback whales in the North Atlantic are recovering. Humpback whale stock estimates from regions within the North Atlantic provide an overall stock size of over

35,000 humpback whales, which is considered as a minimum estimate (Lawson and Gosselin 2018; NAMMCO, 2016; Pike *et al.*, 2019).

13.6.1.158 Studies on abundance and distribution of humpback whales in Scottish waters are limited. There are currently no MUs for humpback whales within UK and Irish waters, and there are no abundance estimates available from SCANS-IV or SCANS-III surveys due to an absence of sightings of the species (Gilles *et al.*, 2023; Hammond *et al.*, 2021; IAMMWG, 2023).

13.6.1.159 During 2023 ORCA surveys, no humpback whales were recorded along survey routes within the marine mammal Study Area (ORCA, 2024).

13.6.1.160 No humpback whales were recorded during site-specific DAS for the Offshore Project, nor for the Oyster Wave Array site-specific surveys, which took place from September 2010-September 2011 (**Appendix 13.1, Volume 2c**; Royal Haskoning, 2012).

13.6.1.161 Humpback whale song was recorded between January and May 2024, and from December 2024-February 2025 during PAM surveys for the Project, which were carried out from January 2024-February 2025. Humpback whales were detected on 110 days between January-early May, which accounted for 31.2% of the monitoring period. A clear seasonal pattern of humpback whale song was detected, with song being particularly prevalent between early February-mid-April, during which it was detected every day of the week, with the exception of 2 weeks. PAM data from May-September 2024 suggested an absence of humpback whales at both sites (**Appendix 13.2, Volume 2**).

Density

13.6.1.162 Studies focusing on humpback whale density in the North Atlantic are limited, and there are currently no density estimates for humpbacks on the west coast of Scotland/*Alba*. No density estimates are available from SCANS-IV or SCANS-III surveys, nor site-specific surveys (**Appendix 13.1, Volume 2c**; Gilles *et al.*, 2023; Hammond *et al.*, 2021; Lacey *et al.*, 2022). The lack of density estimates for humpback whales on the west coast of Scotland/*Alba* is likely due to the low numbers present in the region.

Fin whale

Ecology and Conservation

13.6.1.163 Fin whales are the second largest species in the baleen whale family and are widely distributed throughout the world's oceans, including throughout tropical, temperate and polar waters. Fin whales travel thousands of miles from breeding and mating grounds at low latitudes to high latitude feeding grounds (Reid *et al.*, 2003). Fin whale diet varies regionally, with the main prey type being krill and small schooling fishes such as capelin, anchovies, sprat and herring (Das *et al.*, 2017; Ryan *et al.*, 2014). Fin whales are usually seen alone or in small groups but gather in large aggregations at feeding grounds (Reid *et al.*, 2003).

13.6.1.164 Fin whales have a gestation period of approximately 11-12 months and give birth to a single calf during the winter months (Kjeld et al., 2006; Lockyer, 1984). Calves nurse for 6-8 months and are weaned when they are approximately 10-12 meters in length. Mating occurs during the winter months following the calving period.

13.6.1.165 Fin whale is listed as a vulnerable species on the IUCN red list and has an unknown overall conservation status due to a lack of data to inform an assessment on population trends, habitat availability and future prospects for the species (Cooke, 2018c; JNCC, 2019l).

13.6.1.166 The designation of MPAs is not a requirement for fin whales in Scottish waters. There are no protected areas where fin whales are listed as a primary feature or feature of interest within the marine mammal Study Area. Fin whales are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA (IUCN-MMPATF, 2024a).

Distribution and abundance

13.6.1.167 Fin whales have a preference for deeper continental shelf edge waters and are present in low numbers within the marine mammal Study Area, primarily from April-October (Baxter *et al.*, 2011; Hague *et al.*, 2018; HWDT, 2018). Most records of fin whales in the region are in deep offshore waters, particularly to the east of the Isle of Lewis*/Eilean Leòdhais* and throughout the Minch/*Mhaoil* (HWDT, 2024).

13.6.1.168 Fin whales were historically targeted by commercial whalers in the Outer Hebrides/*Na h-Eileanan Sia*, where they were the most frequently caught species alongside sei whales between 1903-1951 (Ryan *et al.*, 2022). There is clear evidence of their recovery in the North Atlantic, with the population now likely close to or larger than population levels pre-whaling in the 1880s. The latest population estimate for fin whales suggests there are at least 80,000 fin whales in the North Atlantic (NAMMCO 2011; Cooke 2018c).

13.6.1.169 Studies on abundance and distribution of fin whales in Scottish waters are limited. There are currently no MUs for fin whales within UK and Irish waters. No fin whales were recorded within SCANS-IV blocks CS-I and CS-J, or within SCANS-III blocks J and K (Gilles *et al.*, 2023; Hammond *et al.*, 2021). The SCANS-III vessel-based surveys did record fin whales within survey block 8, which is located to the offshore region north and west of the Offshore Project.

13.6.1.170 During 2023 ORCA surveys, there were no sightings of fin whales in the Minches/*A' Mhaoil*, with the exception of the north of the Minch/*Mhaoil* and the east of northern Lewis/*Leòdhais*, where there were 0.16-0.36 sightings of fin whales per 100 km effort (ORCA, 2023).

13.6.1.171 No fin whales were recorded during site-specific DAS for the Offshore Project, nor for the Oyster Wave Array site-specific surveys, which took place from September 2010-September 2011 (**Appendix 13.1, Volume 2c**; Royal Haskoning, 2012).

13.6.1.172 No fin whales were detected during PAM surveys for the Offshore Project, which were carried out from January 2024-February 2025 (**Appendix 13.2, Volume 2**).

Density

13.6.1.173 No density estimates for fin whales are available within relevant SCANS-III or SCANS-IV blocks (Gilles *et al.*, 2023; Hammond *et al.*, 2021). Modelled density surfaces from SCANS-III provided a fin whale density estimate of 0.000-0.025 animals/km² throughout UK waters, including throughout the west coast of Scotland/*Alba* and Western Isles/*na h-Eileanan Siar* (**Figure 13.10, Volume 2b**; Lacey *et al.*, 2022). SCANS-II/CODA data also presented low densities of 0-0.025 animals/km² throughout UK waters (Lacey *et al.,* 2022).

13.6.1.174 No density estimates are available from site-specific DAS for the Offshore Project, nor for the Oyster Wave Array site-specific surveys, which took place from September 2010-September 2011 (**Appendix 13.1, Volume 2c**; Royal Haskoning, 2012).

Summary of cetacean estimates

13.6.1.175 Data sources providing information on cetacean abundance and density estimates are summarised in **Table 13-17** and **Table 13-18**.

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Table 13-17 Abundance estimates for cetaceans in the Study Area

Species	DAS Site-Specific Surveys (maximum apportioned within survey area)	SCANS-III Survey Block J	SCANS-III Survey Block K	SCANS-IV Survey Block CS-I	SCANS-IV Survey Block CS-J	UK Portion of Management Units
Harbour porpoise	1,331 (95% CI=442-2,479)	2,045 (CV=0.72; 95% CI=0-5,313)	9,999 (CV=0.27; 95% CI= 5,643-16,306)	1,276 (CV=0.907; 95% CI=4-4,246)	3,231 (CV=0.569; 95% CI=620-7,758)	WS=24,305 (CV=0.18; 95% CI=17,121-34,505)
White-beaked dolphin	52 (95% CI=6-155)	1,871 (CV=0.91; 95% CI=0-5,856)	7,055 (CV=0.53; 95% CI=1,799-16,040)	-	8,335 (CV=0.596; 95% CI=55-19,218)	CGNS=34,025 (CV=0.28; 95% CI=20,026-57,807)
Common dolphin	481 (95% CI=124-967)	4,679 (CV=0.95; 95% CI=0-16,108)	-	5,888 (CV=0.886; 95% CI=30-19,262)	-	CGNS=57,417 (CV-0.32; 95% CI=30,850-106,863)
Bottlenose dolphin	9 (95% CI=1-26)	-	-	14,208 (CV=0.473; 95% CI=104-29,117)	-	CWSH=45 (*;95% CI=33-66) OW=1,299 (95% CI=597-2,826)
Risso’s dolphin	93 (95% CI=11-280)	6,750 (CV=0.80; 95% CI=0-19,557)	440 (CV=0.76; 95% CI=0-1,222)	-	936 (CV=0.649; 95% CI=7-3,219)	CGNS=8,687 (CV=0.63; 95% CI=2,810-26,852)
Atlantic white-sided dolphin	-	-	-	-	756 (CV=0.737; 95% CI=8-2,087)	CGNS=12,293 (CV=0.64; 95% CI=3,891–38,841)
Long-finned pilot whale	-	79 (CV=1.16; 95% CI=10-641)	1,733 (CV=1.06; 95% CI=271-11,084)	93 (CV=1.240; 95% CI=5-1,788)	-	-
Killer whale	60 (CV=7-172)	-	-	-	-	-

Species	DAS Site-Specific Surveys (maximum apportioned within survey area)	SCANS-III Survey Block J	SCANS-III Survey Block K	SCANS-IV Survey Block CS-I	SCANS-IV Survey Block CS-J	UK Portion of Management Units
Beaked whale species	-	325 (CV=0.621; 95% CI=91-1,163)	211 (CV=0.904; 95% CI=41-1,091)	132 (CV=1.227; 95% CI=7-2,662)	-	-
Minke whale	9 (95% CI=1-35)	647 (CV=1.04; 95% CI=0-2,994)	295 (CV=0.81; 95% CI=0-994)	1,038 (CV=0.731; 95% CI=3-3,759)	718 (CV=0.545; 95% CI=174-1,857)	CGNS=10,288 (CV=0.26; 6,210-17,042)
Humpback whale	-	-	-	-	-	-
Fin whale	-	-	-	-	-	-
Notes: *=estimate determined using photo-identification methods, -=no estimate available, 95% CI=estimated lower and upper 95% confidence limits of abundance, CV= Coefficient of variation. MU abbreviations: WS=West Scotland, CGNS= Celtic and Greater North Seas, CWSH= Coastal West Scotland & Hebrides						
Sources: Appendix 13.1, Volume 2c ; Gilles *et al.*, 2023, Hammond *et al.*, 2021; IAMMWG, 2023						

Table 13-18 Density (individuals/km^2) estimates for cetaceans in the Study Area

Species	Highest Density within DAS Area (corrected and apportioned)	SCANS-III Survey Block J	SCANS-III Survey Block K	SCANS-IV Survey Block CS-I	SCANS-IV Survey Block CS-J	Modelled Density Surface Estimate (Study Area)
Harbour porpoise	1.39	0.058 (CV=0.72)	0.308 (CV=0.27)	0.0364 (CV=0.907)	0.0994 (CV=0.569)	0.00-0.40
White-beaked dolphin	0.05	0.053 (CV=0.91)	0.217 (CV=0.53)	-	0.2565 (CV=0.596)	0.00-0.30
Common dolphin	0.50	0.133 (CV=0.95)	-	0.1678 (CV=0.886)	-	0.00-0.07
Bottlenose dolphin	0.01	-	-	0.4048 (CV=0.473)	-	0.00-0.05

Species	Highest Density within DAS Area (corrected and apportioned)	SCANS-III Survey Block J	SCANS-III Survey Block K	SCANS-IV Survey Block CS-I	SCANS-IV Survey Block CS-J	Modelled Density Surface Estimate (Study Area)
Risso's dolphin	0.10	0.192 (CV=0.80)	0.014 (CV=0.76)	-	0.0288 (CV=0.649)	None
Atlantic white-sided dolphin	-	-	-	-	0.0233 (CV=0.737)	None
Long-finned pilot whale	-	0.002 (CV=1.16)	0.053 (CV=1.06)	0.0026 (CV=1.240)	-	0.00-0.55
Killer whale	0.06	-	-	-	-	None
Beaked whale species	-	0.009 (CV=0.621)	0.006 (CV=0.904)	0.0038 (CV=1.227)	-	0.00-0.05
Minke whale	0.01	0.018 (CV=1.04)	0.009 (CV=0.81)	0.0296 (CV=0.731)	0.0221 (CV=0.545)	0.00-0.05
Humpback whale	-	-	-	-	-	-
Fin whale	-	-	-	-	-	0.000-0.025
Notes: -=no estimate available; SCANS blocks are geographical areas used for quantifying marine mammal abundances and densities from surveys; the 2 SCANS survey blocks included here are those which overlap with the Offshore Project's Array Area, CV= Coefficient of variation.						
Sources: Appendix 13.1, Volume 2c; Gilles *et al.*, 2023, Hammond *et al.*, 2021; IAMMWG, 2023; Lacey *et al.*, 2022						

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Pinnipeds

13.6.1.176 There are 2 resident species of pinniped in Scotland/*Alba*, the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina*. Both species are present throughout the Outer Hebrides/*Na h-Eileanan Sia*, including the northwest coast of the Isle of Lewis/*Eilean Leòdhais*. Grey seals are present in higher numbers than harbour seals throughout the Western Isles SMU.

13.6.1.177 Designated sites where seal species are listed as qualifying features in the vicinity of the marine mammal Study Area are presented within **Figure 13.2, Volume 2b** (alongside those listed in the cetacean baseline) and listed in **Table 13-19**. There are 194 designated seal haul-out (designated for both species) and grey-seal-specific breeding colony sites in Scotland/*Alba*, with 27 within the Western Isles SMU. Seal haul-out sites within 50 km of the Offshore Project are listed in **Table 13-19**, as harbour seal foraging movements are generally restricted to within 50 km of haul-out sites (Carter *et al.*, 2022).

Table 13-19 Protected Areas for Pinnipeds

Designated Site	**Closest Distance to Offshore Project (km)**	**SMU**	**Qualifying feature**
Special Areas of Conservation			
North Rona	84	Western Isles	Grey seal
Monach Islands	100	Western Isles	Grey seal
Ascrib, Islay and Dunvegan	120	West Scotland	Harbour seal
Sound of Barra	145	Western Isles	Harbour seal
Eileanan agus Sgeiran Lios mor	290	West Scotland	Harbour seal
Treshnish Isles	300	West Scotland	Grey seal
South-East Islay Skerries	310	West Scotland	Harbour seal
Designated Haul-out Sites			
Sgeir Leathann (Broad Bay)	25	Western Isles	Harbour and grey seals
Gasker	46 (direct)	Western Isles	Harbour and grey seals
Eilean Glas Cheann Chrionaig	47	Western Isles	Harbour and grey seals
Aird Dhubh	49	Western Isles	Harbour and grey seals
Bhalamus	50	Western Isles	Harbour and grey seals

Grey seal

Ecology and Conservation

13.6.1.178 Grey seals occur throughout the North Atlantic where they are present in near-shore and offshore waters. They are generalist feeders and forage on a wide variety of prey species including sandeels – the dominant prey species in the UK – cod, whiting, haddock, ling, plaice, sole, flounder and dab (SCOS, 2023). Target prey species vary seasonally and geographically. They mainly forage on the seabed at depths of up to 100 m, with foraging trips lasting up to 30 days. Greys seals also forage in offshore continental shelf waters and regularly travel over 100 km between haul-out sites (Carter *et al.*, 2022; SCOS, 2023). Movements of grey seals between the Outer Hebrides/*Na h-Eileanan Sia* and the North Sea have been recorded, as well as movements between the Inner Hebrides and Wales and France (SCOS, 2023).

13.6.1.179 Grey seals regularly return to haul-out sites to rest, moult and breed. They haul-out to moult between December and April, with the Scottish pupping season occurring between early September-late November (SCOS, 2023). Grey seals have a gestation period of approximately 11.5 months and give birth to a single pup every year. Pups suckle for 17-23 days and, following this, moult their white natal coat and go out to sea approximately 2-3 weeks later. Mating occurs at the end of lactation (SCOS, 2023).

13.6.1.180 Grey seal is a species of least conservation concern on the IUCN red list and has a favourable conservation status within UK waters, with both short- and long-term trends showing a continued increase in grey seal abundance (Bowen *et al.*, 2016; JNCC, 2019m).

13.6.1.181 Grey seals are protected under the Marine (Scotland) Act 2010 and are listed under Annex II of the Habitats Directive as a species of Community Interest, which has been transposed into Scottish law through the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. Annex II of the Habitats Directive requires the designation of SACs for the species. Grey seals are a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). Grey seals are listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA, the latter of which is identified as important for breeding (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.182 Grey seals are distributed throughout Scottish coastal waters year-round within the marine mammal Study Area, with approximately 35% of the world's grey seals breeding in the UK and 80% of those breeding at colonies in Scotland/*Alba* (SCOS, 2023). The main concentrations of grey seals in Scottish waters are in the Outer Hebrides/*Na h-Eileanan Sia* and Orkney/*Arcaibh*. In these regions, grey seals inhabit remote islands and coastlines. Haul-out sites and breeding locations where females with young pups can move inland, away from busy beaches and storm surges, are preferred (SCOS, 2023).

13.6.1.183 Grey seal abundance within SMUs can be estimated by modelling pup production estimates or scaling August haul-out counts (Hague *et al.*, 2020). At a regional level, population trends are based on pup distribution in the autumn, therefore outside of the breeding season, grey seals may have an alternative distribution (SCOS, 2023). The Offshore Project lies within the Western Isles SMU, with the marine mammal Study Area also largely within the West Scotland SMU and slightly overlapping with the North Coast and Orkney SMU.

13.6.1.184 Grey seal pup production estimates for the Outer Hebrides/*Na h-Eileanan Sia* region in 2019 was 16,083, which is an average annual change of +0.7% compared to 2016, which had an estimate of

15,732 (SCOS, 2023). The total pup production for Scotland/*Alba* in 2019 was 54,064, and 54,741 in 2016, which is a mean annual decrease of 0.4%. Scotland/*Alba* makes up a large proportion of the UK's total grey seal pup production, which was estimated at 67,789 in 2019 and 65,054 in 2016 (SCOS, 2023). There is clear evidence to suggest that grey seal populations in the Inner Hebrides/*Na h-Eileanan a-staigh* and Outer Hebrides/*Na h-Eileanan Sia* have reached their carrying capacity[3] (SCOS, 2023).

13.6.1.185 Pup production estimates for the Western Isles SMU indicate that pup production is stable/increasing (SCOS, 2022). Pup production estimates within the Monach Islands SAC are stable/increasing with an estimate of 12,511. Within the North Rona SAC the pup production estimate is 286, with SAC trends indicating a decline in grey seal pup production (SCOS, 2022). Pup production within the West Scotland SMU is stable, and within the Treshnish Isles SAC pup production is also stable with a latest estimate of 1,131 (SCOS, 2022). Pup production within the North Coast and Orkney SMU is stable, and stable/declining within the Faray and Holm of Faray SAC, which has a pup production estimate of 2,186 (SCOS, 2022).

13.6.1.186 The latest August count data from 2017 for grey seals indicates that within the Western Isles SMU, the population is stable. The Monach Islands SAC has a latest count of 2,701 in 2017, and is stable. The North Rona SAC has a latest count of 175 in 2014, with the SAC trends not having been examined (SCOS, 2022). The latest August count data for grey seals from 2018 indicates that within the West Scotland SMU, the population is increasing. Within this SMU, the Treshnish Isles SAC has a latest August count of 160 in 2018; trends within the SAC have not been examined. Within the Orkney and North Coast SMU, the Faray and Holm of Faray SAC trends have also not been examined. The overall count data trend for this SMU is stable/increasing, and the SAC count was 228 in 2019 (SCOS, 2022).

13.6.1.187 Site-specific DAS for the Offshore Project recorded grey seals in all months across the 2-year survey period excluding May and December 2022, and March, June, July, and December 2023 (**Appendix 13.1, Volume 2c**). Peak abundance occurred in May 2023, with an abundance estimate of 771 (95% CI=93-1,905). Grey seals were recorded throughout the majority of the Survey Area, with a higher number of records in coastal areas to the south of the Array Area. Grey seals were also recorded within the southern region of the Array Area and within the OCAS during Baited Remote Underwater Video system sampling (Ocean Ecology, 2024).

13.6.1.188 During site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011, grey seals were recorded within the Study Area throughout the year, with lower numbers recorded during the months of May and June (Royal Haskoning, 2012). Seals were generally recorded resting.

[3] The maximum number of individuals of a species that can be supported in the environment, given limitations of resources, such as food, water, space, etc. and at which a population finds its stable equilibrium.

Density

13.6.1.189 Across the marine mammal Study Area, the estimated grey seal at-sea relative density varies from 0 to >0.1 % of the at-sea population per km² (**Figure 13.11, Volume 2b**). Within the Array Area, the grey seal mean at-sea population per 25 km² is approximately 0-0.001% of the UK and Ireland population, which equates to between 0 and 1 animal per 25 km² (Carter *et al.*, 2022) or 0-0.04 animals/km². Localised high-density at-sea areas for grey seals of up to >0.1% of the UK and Ireland population are located across the west coast of Scotland/*Alba*, including the offshore area between the Monach Isles and St. Kilda to the west of the Isle of Harris/*Na Hearadh*, between the Isle of Harris/*Na Hearadh* and the Isles of Coll/*Cola* and Tiree/*Tiriodh* and to the north of the Isle of Islay/*Ìle* (**Figure 13.11, Volume 2b):**; Carter *et al.*, 2022). The largest region of high at-sea mean population is the waters around the Orkney/*Arcaibh* Islands (Carter *et al.*, 2022; Morris *et al.*, 2021). Grey seals tend to have localised regions (within 20 km of haul out sites) of higher density generally concentrated closer to the breeding season (Carter *et al.*, 2022).

13.6.1.190 Site-specific DAS for the Offshore Project gave density values for all months in which grey seals were recorded, with an overall highest density estimate of 0.8 individuals/km² in May 2023 (**Appendix 13.1, Volume 2c**). Of the months where grey seals were recorded, the lowest density estimate was 0.01 individuals/km², which occurred during April 2022 and August 2023 (**Appendix 13.1, Volume 2c**).

13.6.1.191 Within **Figure 13.11, Volume 2b** each cell value represents the percentage of the UK and Irish at-sea population estimated to be present at any one time during the main foraging season (summer), referred to as 'relative density'. These estimates exclude any animals hauled out.

Harbour seal

Ecology and Conservation

13.6.1.192 Harbour seals are present in coastal areas of the North Atlantic and North Pacific, from the subtropics to the Arctic (SCOS, 2023). They forage on a wide variety of prey species including sandeels, gadoids, herring and sprat, flatfish, octopus, and squid. Target prey species vary seasonally and geographically. Foraging ranges vary regionally and within sites, with some individuals foraging >100 km from the nearest haul-out site, and some remaining in nearby inshore waters (SCOS, 2023). Harbour seals are considered to be more sedentary than grey seals and few long-range movements between haul-out sites have been recorded, with most foraging trips at a distance of 40-50 km from haul-out sites (Carter *et al.*, 2022; SCOS, 2022; 2023).

13.6.1.193 Harbour seals regularly haul-out on land to rest, moult and breed, and come ashore in sheltered areas, particularly on sand banks and estuaries but also in rocky areas (SCOS, 2023). They haul-out to give birth in June and July, with the annual moult occurring in August. Harbour seals have a gestation period of approximately 11 months and give birth to a single pup every year (Hall *et al.*, 2020; SCOS, 2023). Harbour seal pups can swim almost immediately after birth, and shed their white coat *in utero* (SCOS, 2023). They suckle for approximately 21-26 days and, unlike grey seals, harbour seal mothers forage during the lactation period and undertake regular foraging trips during this time (Arso-Civil *et al.*, 2021; Hague *et al.*, 2020; Lowry, 2016; Thompson *et al.*, 1994). Mating occurs approximately a month after birthing (Lowry, 2016).

13.6.1.194 Harbour seal is a species of least conservation concern on the IUCN red list and has an Unfavourable-Inadequate conservation status within UK waters (JNCC, 2019n; Lowry, 2016). Serious declines of harbour seals are still apparent within Scottish colonies, and therefore the population is assessed to have poor future prospects.

13.6.1.195 Harbour seals are protected under the Marine (Scotland) Act 2010 and are listed under Annex II of the Habitats Directive as a species of Community Interest, which has been transposed into Scottish law through the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. Annex II of the Habitats Directive requires the designation of SACs for the species. Harbour seals are a Scottish PMF, identifying them as a species of conservation importance (Howson *et al.*, 2012). They are also listed under the Monach Isles and Outer Hebrides Western Continental Shelf IMMA and the Minches and the Sea of the Hebrides IMMA, the latter of which is identified as important for breeding (IUCN-MMPATF, 2024a; 2024b).

Distribution and abundance

13.6.1.196 Harbour seals are wide-ranging throughout European waters and are present year-round within the marine mammal Study Area. The largest Scottish populations are located in the Hebrides and Northern Isles. Approximately 32% of European harbour seals are found in the UK, with 85% of UK harbour seals present in Scotland/*Alba* (SCOS, 2023). The Offshore Project lies within the Western Isles SMU, with the marine mammal Study Area also largely within the West Scotland SMU and slightly overlapping with the North Coast and Orkney SMU.

13.6.1.197 Harbour seal abundance within SMUs can be calculated by scaling the August haul-out count data for the year of interest with data from tagged seals to correct for the proportion of seals hauled-out at the time of the count (Hague *et al.*, 2020). Harbour seals spend a higher proportion of their time hauled out during the moult compared to other times of year and therefore counts during this time period are thought to represent the highest proportion of the population with the lowest variance (SCOS, 2022).

13.6.1.198 Count data for harbour seals from August 2017 indicate that within the Western Isles SMU, the population is increasing, although in August 2017, the count within the Sound of Barra SAC was 132, with potential trends indicating depletion/decline within the SAC (SCOS, 2022). The latest data for harbour seals, from August 2018, indicate that within the West Scotland SMU, the population is also increasing. A total of 3 SACs for harbour seal are within the West Scotland SMU, with all SAC trends estimated to be stable. In 2018, the Ascrib, Isay and Dunvegan SAC had a latest August count of 712 in 2017, the Eileanan agus Sgeiran Lios mor SAC had a latest August count of 238, and the South-East Islay Skerries SAC had a latest count of 706 (SCOS, 2022). The harbour seal trend within the North Coast and Orkney SMU is declining, with potential decline within the Sanday SAC, which had a latest August count of 77 in 2019 (SCOS, 2022).

13.6.1.199 Site-specific DAS for the Offshore Project recorded harbour seals in May 2022 and May, June and September 2023 (**Appendix 13.1, Volume 2c**). Peak abundance occurred in September 2023, with an abundance estimate of 86 (95% CI=10-257). Confirmed harbour seal records were not within the Array Area, but the southern area of the 10 km buffer, in near-shore coastal areas near to the islands of Flodaigh and Bearasay/*Bearasaigh*.

13.6.1.200 During site-specific vantage point surveys for the Oyster Wave Array, which took place from September 2010-September 2011, no harbour seals were sighted.

Density

13.6.1.201 Across the marine mammal Study Area, the estimated harbour seal at-sea relative density varies from 0->0.1 % of the at-sea population per km² (**Figure 13.12, Volume 2b**). Within the Array Area, the harbour seal mean at-sea population per 25 km² is approximately 0-0.005% of the UK and Ireland population, which equates to between 0 and 2 animals per 25 km^2 (Carter *et al.*, 2022) or 0-0.08 animals/km^2. Localised high-density at-sea areas for harbour seals are located throughout coastal west Scotland/*Alba*, with many regions having an estimated mean at-sea population of >0.1% of the UK and Ireland population. These areas are located particularly within the Inner Hebrides/*Na h-Eileanan a-staigh* and the Little Minch. Regions within the Minch and Sea of the Hebrides have high densities in coastal regions, with the mean at-sea population decreasing as distance to land increases (**Figure 13.12, Volume 2b**; Carter *et al.*, 2022). Harbour seal localised regions of higher density are more tightly concentrated than those for grey seal, with harbour seal distribution being negatively associated with distance from haul-out site and water depth, and the highest at-sea densities occurring near to favourable haul-out sites (Carter *et al.*, 2022).

13.6.1.202 Site-specific DAS for the Offshore Project gave density values for months where harbour seals were recorded, including May 2022, and May, June, August and September 2023. Harbour seal density ranged from 0.02-0.09 individuals/km², with the latter value occurring in September 2023 (**Appendix 13.1, Volume 2c**).

13.6.1.203 Within **Figure 13.12, Volume 2b** each cell value represents the percentage of the UK and Irish at-sea population estimated to be present at any one time during the main foraging season (spring), referred to as ‘relative density’. These estimates exclude any animals hauled out.

Summary of pinniped estimates

13.6.1.204 Data sources providing information on seal populations and density estimates are summarised in **Table 13-20**.

Table 13-20 Pinniped density, abundance and count data, and grey seal pup production within SACs and SMUs.

	Count Data		Pup Production		Density		Abundance
Pinniped Species	**Special Areas of Conservation**	**Seal Monitoring Unit**	**Special Areas of Conservation**	**Seal Monitoring Unit**	**At-Sea Relative Density of Array Area (% of UK/Ireland population per 25 km²)**	**Site-Specific DAS (maximum apportioned within survey area; animals/km²)**	**Site-specific DAS (maximum apportioned within survey area)**
Grey Seal	Monach Islands: 2,701 (2017) North Rona: 175 (2014) Treshnish Isles: 160 (2018)	Western Isles: 31,000 (2016-2019 census)	Monach Islands: 12,511 (2019) North Rona: 286 (2019) Treshnish Isles: 1,131 (2019)	Western Isles: 16,083 (2019)	0-0.001	0.80	771 (95% CI=93-1,905)
Harbour Seal	Sound of Barra: 132 (2017) Ascrib, Isay and Dunvegan: 712 (2017) Eileanan agus Sgeiran Lios mor: 238 (2018) South-East Islay Skerries: 706 (2018)	Western Isles: 4,905 (2016-2021 census)	-	-	0-0.005	0.09	86 (95% CI=10-257)
Notes: -=no estimate available							
Sources: **Appendix 13.1, Volume 2c**; Carter *et al.*, 2022; SCOS, 2022; 2023.							

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Important Ecological Features

13.6.1.205 IEFs are habitats, species, ecosystems, and their functions/processes that are considered to be important and potentially impacted by the Offshore Project. In accordance with best practice guidelines (CIEEM, 2022), for the purposes of the marine mammal EIA, IEFs have been identified. The potential impacts of the Offshore Project which have been scoped into the assessment (see **Table 13-6**) have been assessed against the IEFs to determine whether or not the effect is considered significant. The IEFs assessed are those that are considered to be important and potentially affected by the Offshore Project. Importance (or value) may be assigned due to quality of extent of habitats, habitat or species rarity, or the extend to which they are threatened (CIEEM, 2022). Species and habitats are considered IEFs if they have a specific biodiversity importance recognised through the international or national legislation or through local, regional, or national conservation plans (e.g. Annex I habitats under the Habitats Directive, OSPAR, National Biodiversity Plan or the Marine Strategy Framework Directive, Scottish PMFs, and the Scottish Biodiversity list).

13.6.1.206 All of the IEFs within the marine mammal Study Area are listed in **Table 13-22**, providing justifications for importance rankings. The criteria used to define IEF importance are listed in **Table 13-21**. Within the Marine Mammal Study Area, the only relevant category of IEFs is 'species'. There are no IEF habitats or ecosystems which are included within this chapter.

13.6.1.207 Based upon this information, the marine mammal IEFs presented in **Table 13-22** will be assessed in Sections 13.8 and 13.9.

Table 13-21 Criteria used to inform the importance of IEFs in the marine mammal Study Area (derived from guidance published by CIEEM (2022))

IEF Importance	IEF criteria used to define importance
International	• Internationally designated sites, or species designated under international law (i.e., species designated under the OSPAR List of Threatened and/or Declining Species, or species listed as Critically Endangered, Endangered or Vulnerable on the IUCN Red List).
National	• Species protected under national law (i.e., Annex II species listed as features of SACs) within the National Site Network. Annex II species which are not listed as features of SACs in the Study Area; • Species protected under national legislation, including The Conservation of Salmon (Scotland) Regulations 2016 (as amended) and the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003; • Species protected under the Scottish Eel Management Plan (2010); • Species protected under national policy, including the Scottish Wild Salmon Strategy (Scottish Government, 2022), and the Eel Management plans for the United Kingdom: Scotland River Basin District (Defra, 2010); • Species listed as a PMF: Scotland adopted a list of 81 PMFs in 2014, representing species and habitats on existing conservation lists that were assessed against a set of criteria, including the abundance of the feature in

IEF Importance	IEF criteria used to define importance
	Scottish seas, the conservation status and the functional role played by the feature; • Scottish Biodiversity List species that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, species classified as features of conservation importance that have regionally important populations within the study area (are locally widespread and/or abundant); • NC MPA features, including species classified as features of conservation importance and broad-scale habitats; • Species that have spawning or nursery areas within the study area that are important nationally (e.g., may be primary spawning/nursery area for that species).
Regional	• Scottish Biodiversity List species that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, species classified as features of conservation importance that have regionally important populations within the study area (are locally widespread and/or abundant); • NC MPA features, including species classified as features of conservation importance and broad-scale habitats; • Species of commercial importance, to fisheries in the area; • Species of ecological importance (i.e., are an important prey item for other species of conservation or commercial value and that are key components of the fish assemblages in the study area. Species that have spawning or nursery areas within the study area that are important regionally.
Local	• Species of commercial importance, but do not form a key component of the fish assemblages within the study area. The spawning/nursery area for the species is located outside of the study area. The species is common throughout the UK but forms a component of the fish assemblages in the study area.

Table 13-22 IEFs within the Offshore Project marine mammal Study Area

IEF	Scientific name/ representative species	Importance	Justification
Marine mammal species			
Harbour porpoise	*Phocoena phocoena*	International	Harbour porpoises are legally protected at an international and national level, as detailed in **Table 13-1**.
White-beaked dolphin	*Lagenorhynchus albirostris*	International	White-beaked dolphins are legally protected at an international and national level, as detailed in **Table 13-1**.
Common dolphin	*Delphinus delphis*	International	Common dolphins are legally protected at an international and national level, as detailed in **Table 13-1**.
Bottlenose dolphin	*Tursiops truncatus*	International	Bottlenose dolphins are legally protected at an international and national level, as detailed in **Table 13-1**.
Risso's dolphin	*Grampus griseus*	International	Risso's dolphins are legally protected at an international and national level, as detailed in **Table 13-1**.
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	International	Atlantic white-sided dolphins are legally protected at an international and national level, as detailed in **Table 13-1**.
Long-finned pilot whale	*Globicephala melas*	International	Long-finned pilot whales are legally protected at an international and national level, as detailed in **Table 13-1**.
Killer whale	*Orcinus orca*	International	Killer whales are legally protected at an international and national level, as detailed in **Table 13-1**.
Beaked whale species	Ziphiidae	International	Beaked whales are legally protected at an international and national level, as detailed in **Table 13-1**.
Minke whale	*Balaenoptera acutorostrata*	International	Minke whales are legally protected at an international and national level, as detailed in **Table 13-1**.
Humpback whale	*Megaptera novaeangliae*	International	Humpback whales are legally protected at an international and national level, as detailed in **Table 13-1**.

IEF	Scientific name/ representative species	Importance	Justification
Fin whale	*Balaenoptera physalus*	International	Fin whales are legally protected at an international and national level, as detailed in **Table 13-1**.
Grey seal	*Halichoerus grypus*	International	Grey seals are legally protected at an international and national level, as detailed in **Table 13-1**.
Harbour seal	*Phoca vitulina*	International	Harbour seals are legally protected at an international and national level, as detailed in **Table 13-1**.

Current baseline summary

13.6.1.208 A review of currently available baseline data and information has been carried out for those marine mammal species identified as potential receptors during the Scoping phase.

13.6.1.209 A quantitative approach will be used to predict the number of affected individuals where there are sufficient data on, e.g. sound source levels, propagation losses, species distribution and dose-response relationships (Graham *et al.,* 2019). Qualitative assessment will be used where data are limited, for example where no density estimate or population estimate is available or there is no established means of quantifying an impact.

13.6.1.210 The EIA will use a combination of these approaches across the different impact pathways and species. Due to paucity of records and low abundance in the Study Area, only a qualitative assessment will be possible for assessments of humpback whale *Megaptera novaeangliae*.

13.6.1.211 A summary of the density estimates and sources, which are used to assess the potential effect of the Offshore Project on marine mammal populations, to be taken forwards into the assessment is presented in **Table 13-23**. A total of 2 density estimates are taken forwards for each species, where available: a uniform density estimate, as assigned to a geographical region, such as a SCANS survey block or the DAS survey area; and a modelled surface density estimate. Where uniform densities are applicable, the highest and therefore most precautionary value has been selected for assessment purposes. For assessment of large geographical ranges, such as those for which an assessment of noise disturbance is made, modelled density surfaces give better spatial resolution. These values are different depending on the geographical location of the impact being assessed and are therefore not presented in **Table 13-23**. The methodology for use of fine-scale densities for calculation of auditory injury and disturbance was discussed in Section 13.5.4.

Table 13-23 Summary of density estimates to be used in the quantitative impact assessment

Species	**MU/SMU, UK population estimate**	**Uniform density estimate (no./km^2)**	**Source of uniform density estimates**	**Source of fine-scale density estimates**
Harbour porpoise	West Scotland, 24,305	1.39	DAS (peak, January 2024)	Lacey *et al.*, 2022
White-beaked dolphin	Celtic and Greater North Seas, 34,025	0.2565	SCANS-IV block CS-J	Lacey *et al.*, 2022
Common dolphin	Celtic and Greater North Seas, 57,417	0.5	DAS (peak January 2024)	Lacey *et al.*, 2022
Bottlenose dolphin	Coastal West Scotland and Hebrides, 45	0.4048	SCANS-IV block CS-I	Lacey *et al.*, 2022

Species	MU/SMU, UK population estimate	Uniform density estimate (no./km^2)	Source of uniform density estimates	Source of fine-scale density estimates
	Oceanic Waters, 1,299	0.4048	SCANS-IV block CS-I	Lacey *et al.*, 2022
Risso's dolphin	Celtic and Greater North Seas, 8,687	0.192	SCANS-III block J	Lacey *et al.*, 2022
Atlantic white-sided dolphin	Celtic and Greater North Seas, 12,293	0.0233	SCANS-IV block CS-J	Lacey *et al.*, 2022
Long-finned pilot whale	None	0.053	SCANS-III block K	Lacey *et al.*, 2022
Killer whale	None	0.06	DAS (peak January 2023)	N/A
Beaked whale species	None	0.009	SCANS-III block J	Lacey *et al.*, 2022
Minke whale	Celtic and Greater North Seas, 10,288	0.0296	SCANS-IV block CS-I	Lacey *et al.*, 2022
Humpback whale	None	None	N/A	N/A
Fin whale	None	None	N/A	Lacey *et al.*, 2022
Grey seal	Western Isles, 31,000	0.80	DAS (peak May 2023)	Carter *et al.*, 2020
Harbour seal	Western Isles, 4,905	0.09	DAS (peak September 2023)	Carter *et al.*, 2020

13.6.2 FUTURE BASELINE

13.6.2.1 The current baseline characterisation for marine mammals within the Marine Mammal Study Area and wider region has been detailed within Section 13.6.1. The abundance, distribution and density of marine mammals is likely to change over time due to natural and anthropogenic factors occurring in the marine environment. Trajectories for marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources. Marine mammal trends are also difficult to study and monitor due to their highly mobile nature and some species' deep, prolonged diving behaviours.

13.6.2.2 Natural fluctuations within the marine environment are likely to have some effect on marine mammal populations, particularly climate change and associated effects, which include geographical range shift, reduction of suitable habitat, food web alterations and increased prevalence of disease (Martin *et al.*, 2023).

13.6.2.3 Evidence of range shift is apparent in some cetacean species present in UK waters, most notably common dolphin, white-beaked dolphin and bottlenose dolphin populations (Martin *et al.*, 2023). The main factor influencing ranges of common dolphin and white-beaked dolphin is temperature, and with sea surface temperatures increasing, both species' northern limits are being pushed to higher latitudes. In the Hebrides, white-beaked dolphin sightings have declined in recent years, whilst sightings of common dolphin have increased, indicating ecological partitioning due to a climate-driven change in sea surface temperatures (MacLeod *et al.*, 2008).

13.6.2.4 There is limited evidence to suggest climate change has directly influenced seal populations in the UK to date, however it has been suggested in Fietz *et al.* (2016) that a combination of management practices and climate change has influenced the boundaries between North Sea subspecies of grey seal (SCOS, 2023). Indirect climate-change effects, such as increasing sea surface temperatures, may have contributed to the increase in disease outbreak, including Phocine Distemper Virus (PDV), which has previously resulted in widespread decline in UK harbour seal populations (SCOS, 2023). There are concerns that future epizootics of PDV may result in further harbour seal depletion, in addition to the risk of the Highly Pathogenic Avian Influenza (HPAI), which has occurred in seals in the United States (US) and Canada, and is widely present within UK seabird populations (SCOS, 2023).

13.6.2.5 Indirect impacts of a changing climate may be frequent in the future, however when predicting how climate change will impact seals, there is much uncertainty. Effects which may occur include rising sea levels, increases in thermal stress, changes in prey distribution and availability, increases in harmful algal blooms (HABs), increases in disease prevalence and in-combination effects of climate and anthropogenic activities, such as offshore renewable developments (Martin *et al.*, 2023). In the future there may be fluctuations in pup mortality as important haul-out sites at low-lying rocky coastlines and caves are affected by rising sea levels and experience increased vulnerability and frequency to storm surges.

13.6.2.6 The future baseline is intended to represent the changes that would occur in the absence of the Offshore Project. In summary of the above, given the effects of climate change, disease and other influences on marine mammal populations, as well as the effects of other infrastructure projects in UK and Irish waters, it would be difficult to predict how different that baseline would look to the current baseline. It might, however, be anticipated that population trends, as reported in Section 13.6.1, would continue along the same trajectory in the absence of the Offshore Project. It is therefore considered that an assessment which is based on current marine mammal baseline data and information is an adequate representation of the baseline for the period until construction activities commence. The future baseline for marine mammals cannot accurately be predicted for the lifetime of the Offshore Project.

13.7 BASIS FOR ENVIRONMENTAL IMPACT ASSESSMENT

13.7.1 MAXIMUM DESIGN SCENARIO

13.7.1.1 Assessing using a parameter-based design envelope approach means that the assessment considers a maximum design scenario whilst allowing the flexibility to make improvements in the future in ways that cannot be predicted at the time of submission of the consent applications. The assessment of the maximum design scenario for each receptor establishes the maximum potential adverse impact and as a result impacts of greater adverse significance would not arise should any other development scenario (as described in **Chapter 3, Volume 1a**) to that assessed within this chapter be taken forward in the final scheme design.

13.7.1.2 The maximum design parameters and assessment assumptions that have been identified to be relevant to marine mammals are outlined in **Table 13-24** and are in line with **Chapter 3, Volume 1a**.

13.7.1.3 Pre-construction surveys will be undertaken prior to installation works to refine the engineering design, confirm seabed conditions, and inform the final micrositing of infrastructure (see Section 3.5.3 in **Chapter 3, Volume 1a**).

13.7.1.4 Although pre-construction surveys may involve some limited and temporary interactions with the marine environment, the potential impacts of any such activities fall well within the MDS parameters assessed for this chapter. The MDS includes activities_such as WTG foundation drilling and grouting, and Offshore Cable installation which represent a conservative upper bound on seabed disturbance, and vessel presence. These MDS activities therefore encompass the environmental footprint of pre-construction survey methods, which are significantly lower in magnitude, duration, and spatial extent.

13.7.1.5 For this reason, the potential environmental interactions of pre-construction surveys are not separately assessed, as they are already inherently accommodated within the worst case assumptions underpinning the MDS for this topic.

13.7.1.6 The difference in timing between pre-construction surveys and construction activities does not affect the assessment because the MDS represents the maximum magnitude of change, independent of phasing or scheduling. The pre-construction surveys occur over a much shorter duration and at materially lower intensities than the MDS bounding activities, and therefore do not introduce any temporal additive effects beyond those already assessed.

Table 13-24 Maximum Design Scenario considered for impacts on Marine Mammals

<table>
<tr><th>Project phase and activity/impact</th><th>Maximum Design Scenario</th><th>Maximum assessment assumptions</th><th>Justification</th></tr>
<tr><td colspan="4">Construction</td></tr>
<tr><td>Auditory injury from piling noise</td><td rowspan="2">Maximum number of foundations: Scenario 1: 60 WTGs connected to 1 OSP and then to Landfall: Installation of up to 60 multi-leg jacket foundations with pin piles to support up to 60 WTGs and 1 multi-leg jacket foundation to support 1 offshore substation platform (OSP) within the Turbine Area.
• Percussive Piling Exclusion Area: percussive piling will not be undertaken in the southwest portion of the Turbine Area.

Percussive Piling:
Percussive Piling Area: percussive piling will only be undertaken within the northeast portion of the Turbine Area. A maximum of 35 WTG foundations and 1 OSP foundation will be installed via percussive piling in the northeast portion of the Turbine Area.
• Maximum number of WTG foundations requiring piling: a maximum of 35 multi-leg jacket foundations, with up to 4 pin piles each equates to a total of 140 pin piles to be installed via percussive piling.
• Maximum number of OSP foundations requiring piling: 1 OSP foundation with up to 16 pin piles equates to a total of 16 pin piles to be installed via percussive piling.
• Maximum pin piles to be installed via percussive piling: 156.

Duration: Limited the length of percussive piling installation of pin piles to 5.5 hours and casings to 4.5 hours per 24-hour period. This is inclusive of soft start and ramp up procedures.

Concurrent piling: No concurrent percussive piling events are permitted.</td><td rowspan="2">Underwater noise modelling: percussive piling of foundation pin piles was modelled and the results are presented in Appendix 13.3, Volume 2c and were used to inform this impact assessment. The parameters are presented in Section 3.4 of Appendix 3.1 Percussive Piling Installation Approach, Volume 1c.</td><td>Represents the maximum number of piles, the maximum possible duration of percussive piling and the greatest hammer energy (leading to the greatest propagation of noise into the water column) as defined in Appendix 13.3, Volume 2c over the longest timeframe. Scenario produces the highest level of impulsive underwater noise that can lead to auditory injury in marine mammals.</td></tr>
<tr><td>Disturbance from piling noise</td><td>At greater distances from the percussive piling activity, noise levels are unlikely to cause auditory injury but may disturb marine mammals, leading to behavioural changes and displacement. The maximum design scenario represents the maximum number of piles, the maximum possible duration of percussive piling and the greatest hammer energy (leading to the greatest propagation of noise into the water column) as defined in Appendix 13.3, Volume 2c over the longest timeframe, leading to potential disturbance and behavioural changes in marine mammals at a greater distance from the percussive piling activity.</td></tr>
</table>

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	Maximum hammer energy: Variable maximum hammer energy across the Percussive Piling Area. This area is split into 3 zones to limit the maximum hammer energy. Zones have increasing maximum hammer energy of 2,500kJ, 3,500kJ, and 5,000kJ, increasing towards the north of the site. **Construction programme:** • Installation of WTG foundations (drilling or piling): will be undertaken between April-October over a 2 year period, totalling 14 months of active work (see **Appendix 3.1, Volume 1c**).		
Auditory injury from other construction noise	**Installation of Offshore Project infrastructure will generate continuous underwater noise:** Activities include cable laying, drill and grout of WTG foundations (in the southwest portion of the Turbine Area), grinding, rock placement, trenching, vessel movements and water jetting. **Duration of construction noise:** • Construction programme: Maximum duration of offshore construction is up to 5 years. Working hours are expected to be 24 hours, 7 days a week. • Offshore construction within the Offshore Project Boundary will only be undertaken during the April-October period, except for HDD activities (HDD exit pit construction and HDD drill release) located within the Landfall Exit Pit Area. • Installation of WTG foundations: will be undertaken between April-October over a 2 year period, totalling 14 months of active work.	Noise-generating activities are estimated at the following sound pressure levels at 1 m (for reference sources, see **Appendix 13.3, Volume 2c**): • Cable laying: 171 dB re 1 μPa; • Drilling (drill and grout): 169 dB re 1 μPa; • Grinding: 183 dB re 1 μPa; • Rock placement: 172 dB re 1 μPa; • Trenching: 172 dB re 1 μPa; • Vessel noise (large): 168 dB re 1 μPa; • Vessel noise (medium): 161 dB re 1 μPa; • Water jetting: 170 dB re 1 μPa.	Represents the key activities producing sustained, non-impulsive noise such as vessel movements and drilling- resulting in the highest levels of continuous underwater noise, over the longest timeframe, that can lead to auditory injury in marine mammals.
Disturbance from other construction noise			At increasing distances from the noise source, noise levels are less likely to cause auditory injury but may still disturb marine mammals, causing behavioural changes and displacement. The maximum design scenario reflects the key activities producing sustained, non-impulsive noise such as vessel movements, and drilling resulting in the highest levels of continuous underwater noise, over the longest timeframe, that can lead to disturbance of marine mammals.
Vessel collision	**Construction vessel presence:** • Maximum number of vessels within the Offshore Project Boundary (208.2 km^2) at any one time is 35.	N/A	Represents maximum amount of vessel traffic anticipated in the Offshore Project Boundary throughout the construction phase, which presents the greatest collision risk to marine mammals.
Disturbance or temporary habitat loss from presence of vessels		N/A	Represents maximum amount of vessel traffic anticipated in the Offshore Project Boundary throughout the construction phase, which has the potential to disturb and therefore temporarily exclude marine mammals from any overlapping habitat.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
Accidental release of pollutants	• Maximum installation vessel movements (return trips) per year is up to 871. • Maximum duration of offshore construction is up to 5 years. Working hours are expected to be 24 hours, 7 days a week. • Refer to Table 3-19 in **Chapter 3, Volume 1a**, for more details on vessel types and movements. Vessel types, maximum number of each type on site at any one time, and maximum number of return trips per year are outlined below: • 1 installation vessel for WTG, 15 trips; • 1 installation vessel for jacket remaining in Array Area, 2 trips; • 2 drilling vessels remaining in Array Area, 4 trips; • 2 grout and pile supply vessels, 80 trips; • 2 barges, 80 trips; • 1 pile install vessel, 60 trips; • 9 cable lay and support vessels, 100 trips; • 2 tug/anchor handlers, 180 trips; • 2 guard vessels, 25 trips; • 6 seabed preparation vessels, 25 trips; • 3 crew transfer vessels, 250 trips; • 2 scour protection installation vessels, 25 trips; • 2 cable protection installation vessels, 25 trips.	N/A	Maximum number of construction vessels within the Offshore Project Boundary at any one time presents the greatest risk of accidental pollution events to the marine environment, which could adverse impact marine mammals health and habitat.
Increases in suspended sediment concentration and reduction in water quality	**Drilling of Pin Piles to Install WTG Foundations**: Scenario 2: 60 WTGs and 12 Array Cables to Landfall: The installation of up to 60 multi-leg jacket foundations with pin piles via drilling and grouting within the Turbine Area to support up to 60 WTGs. **Number of piles per WTG and spacing:** Each multi-leg jacket pile foundation will have up to 4 legs (1 pin pile per leg), each spaced 30-55 m apart at seabed level and 15-35 m apart at MSL. **Pin pile diameter:** Each pin pile will have a maximum diameter of up to 5 m.	**Volume of drill arisings:** 4 piles per foundation are modelled in one location; with a volume of 1,374 or 2,356 m^3/pile/day (for foundation depths of 70 m and 120 m, respectively). **Concurrent pile drilling events:** The model assumes that 3 pile drilling events will occur concurrently. **Maximum pile depth assumption:** Maximum depth of piles within the buried channel (deeper sections of seabed substrate within the Turbine Area) is 120 m and elsewhere within the Turbine Area it is 70 m.	**Scenario 2 (60 WTGs and 12 Array Cables to Landfall):** Represents the largest spatial extent of infrastructure and greatest volume of potential sediment disturbance during the construction phase. **Number of piles per WTG and spacing:** The resolution of the model mesh is not small enough for a spacing of sediment sources 30-55 m apart to influence the results. Therefore, spacing parameters were not included in the model; this ensures a reasonable computational run time. **Concurrent pile drilling events:** 3 piles are modelled simultaneously, with the single remaining pile for this location modelled on its own, which represents the maximum design scenario.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	Drilling depth: Pin piles will be drilled below the seabed to a depth of 15-120 m, depending on location within the Turbine Area (i.e. whether it is inside or outside of the buried channel). **Volume of drill arisings:** Per pin pile is assumed to be 588 m^3, and 141,120 m^3 for all 60 turbine multi-leg jacket foundations (assuming a 30 m average depth per drill event). **Duration:** Installation of WTG foundations (drilling or piling) will be undertaken between April-October over a 2 year period, totalling 14 months of active work (see **Appendix 3.1, Volume 1c**).	**Tidal modelling assumption:** A neap-spring tidal cycle is modelled with pile installation at the northeastern/southwestern extents of the Turbine Area. **Sediment release:** Sediment plumes associated with foundation installation construction activities are assumed to be limited to 2 m from the seabed (see justification in Section 2.3.3.2 in **Appendix 9.2, Volume 2c**).	**Maximum pile depth and diameter assumption:** Maximum pile depths and diameter have been modelled to ensure a worst-case volume of sediment disturbance. **Volume of drill arisings:** Maximum design scenario volume of drill arisings per pin pile value is based on a 30 m average embedment depth. Modelling has used depths of 70 m and 120 m to reflect the maximum depths pin piles will be buried, e.g. the buried channel representing worst case. **Duration:** Maximum timeframe piling activities will take place. **Tidal modelling assumption:** A neap-spring tidal cycle has been modelled to allow for an adequate range of tidal levels and current representation in the modelling exercise. Modelled locations at the edge of the Turbine Area show the maximum extent of sediment disturbance outside the Offshore Project Boundary. **Sediment release:** Sediment disturbed by project construction activities is assumed to be released from within 2 m of the seabed. This assumption enables a conservative assessment of the concentration of the total suspended sediments and subsequent sediment deposition thickness (see Section 2.3.3, **Appendix 9.2, Volume 2c**).
Increases in suspended sediment concentration and reduction in water quality	**Burial of Offshore Cables:** Scenario 2: 60 WTGs and 12 Array Cables to Landfall: Installation of 12 66 kV Array Cable to Final WTG (within Array Area) and 12 66 kV Array Cables to Landfall (within OCAS) via jet trenching. **Offshore Cables:** • Array Cables to Final WTG have a maximum length of 160km; • Array Cables to Landfall have a maximum length of 190 km; • Maximum length of Array Cables is therefore 350 km and maximum diameter of 300 mm. **Installation method:** • Assumes 60% of cable length (210 km) requires installation via jet trenching; • Jetting trench has a maximum width of 7 m and depth of 2 m. Seabed disturbance footprint from	**Sediment release:** Assumes Array Cables will be installed at 300 m/hr with 20% of sediment released into the water column.	**Scenario 2 (60 WTGs and 12 Array Cables to Landfall):** Equates to the greatest length (350 km) of Array Cables to be installed and greatest area of potential sediment disturbance during the construction phase. **Installation Method:** This is the worst-case cable installation method as the sediment release is likely to be at a greater height above the seabed (than the other Array Cable burial methods) where current speeds are higher (see paragraph 9.7.1.2 in **Chapter 9, Volume 2a** for further details). **Duration:** Maximum timeframe array cable burial activities will take place. **Jet trenching extent:** Jet trenching 60% of the Cables length represents a worst-case scenario as it is the maximum amount of jet trenching that could be undertaken to install the Array Cables. **Sediment release:** Speed and percent of sediment released are reasonable worst-case values based on similar assessments. See **Table 2-3** in **Appendix 9.2, Volume 2c** for details on sediment mass flux in different locations within the Study Area. **Seabed preparation:** The potential impacts of seabed preparation activities, including boulder clearance using a boulder plough or boulder grab, were considered as part of the identification

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	jet trenching is anticipated to be approximately 1.47 km^2. **Seabed Preparation:** • Assumes 60% of cable length (210 km) requires boulder clearance to facilitate jet trenching; • Boulder clearance width of 15 m; • Seabed disturbance footprint from boulder clearance is anticipated to be approximately 3.15 km^2. **Duration:** • Construction programme: Maximum duration of offshore construction is up to 5 years. Working hours are expected to be 24 hours, 7 days a week. • Offshore construction within the Offshore Project Boundary will only be undertaken during the April-October period, except for offshore Landfall construction works located within the HDD Exit Pit Area.		of the maximum design scenario for the Physical and Coastal Processes assessment. These activities were reviewed alongside the full range of potential cable installation methods. As outlined in Section 9.7.1.2, **Chapter 9, Volume 2a**, a comparison of ploughing, jetting and mechanical cutting indicated that jet trenching would result in the greatest sediment disturbance and seabed change, due to the volume of sediment mobilised. On this basis, jet trenching was selected as the basis for the modelling assessment as it represents a conservative worst-case scenario for sediment mobilisation associated with either cable installation or seabed preparation activities. The potential impacts of seabed preparation are therefore inherently encompassed within the modelling of jet trenching, which captures the upper bound of sediment disturbance and seabed change that could reasonably arise from these activities. Separate modelling of seabed preparation is not required, as it would not result in impacts greater than those already assessed under the maximum design scenario.
Increases in suspended sediment concentration and reduction in water quality	**Exit Pit Construction:** **Number of Exit Pits:** Excavation of up to 13 HDD exit pits by rock cutting or grinding. **Sediment volume:** • Maximum volume of sediment excavated per HDD Exit Pit: 75 m length x 5 m width x 3.5 m depth = 1,312.5 m^3. • Maximum volume of sediment excavated from all 13 exit pits is 17,062.5 m^3.	**HDD activities modelling:** Modelling results of HDD exit pit construction are presented in **Appendix 9.2, Volume 2c** and were used to inform this impact assessment. **Sediment types:** Assessment considers range of sediment sizes which could be released by rock cutting or grinding.	**Number of Exit Pits:** 13 exit pits equates to 1 per each of the 12 Array Cables and an additional contingency exit pit to account for exit pit collapse, reflecting the maximum number of exit pits the Offshore Project may construct. **Sediment volume:** Represents greatest volume of sediment that could be released into the water column during the excavation of a single exit pit. The HDD drill cutting release models a similar volume of sediment release for fine sediment in the same location and likewise with Array Cable trenching for coarse sediment. **Sediment types:** The methods (cutting or grinding) for constructing the HDD exit pit construction may release fine or coarse sediment into the water column. There is also uncertainty around sediment properties in the Exit Pit Area and therefore it is appropriate to assess a range of sediment sizes. Coarse and fine sediments behave in different ways and so represent a worst-case for different situations (for example finer sediments can be advected over a greater distance by currents, however coarser sediments will settle in smaller areas with larger deposition thicknesses).
	Horizontal Directional Drilling: Drill Cutting Release **Number of bores and volume:** Up to 13 bores drilled with a maximum volume of 1,285m^3 per bore.	**HDD activities modelling:** Modelling results of HDD drill cutting release activity is presented in **Appendix 9.2, Volume 2c** and were used to inform this impact assessment.	**Number of bores and volume:** Represents maximum number of bores and volume per bore reflecting worst case scenario. **Drill release duration:** Release over 1 hour is a reasonable worst-case for SSCs.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	Number of rigs: 2 drill rigs. **Drill release duration:** 24 hours working, 7 days a week. **Drill fluid density:** Volume of suspended cuttings varies dependent on drilling fluid density.	**Single bore modelled:** Single representative bore release modelled at a central point within the Landfall Exit Pit Area. **Tidal modelling assumption and drill release duration:** Drill releases of entire bore over 1 hour at a peak spring tide and during slack water on a neap tide. **Drill fluid density:** Assumed 27% cuttings in a very dirty drilling fluid.	**Number of rigs and single bore modelled:** Whilst the Project Design Envelope allows for concurrent HDD activities, works will be managed so that break out activities will occur sequentially (i.e. 1 break out activity is undertaken at once). Although there will be up to 13 HDD bores, only 1 activity has been modelled in a central location to provide a representative drill release scenario. **Tidal modelling assumption:** The modelled release point at mid-tide on a peak spring has the potential to transport the sediment plume furthest. This is a worst-case impact in terms of extent. The HDD release at slack water on a neap tide is also modelled which will likely result in higher SSCs. However, this will likely be over a smaller area. **Drill fluid density:** 27% represents worst-case drill cutting percent.
Indirect effects of impacts on prey availability	Significant effects on prey species during the construction phase of the Offshore Project, as determined by the impact assessments in **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.	N/A	Fish and invertebrate species are prey for marine mammals. Significant effects on prey species have the potential for indirect effects on marine mammals, therefore, this assessment has relied on the outputs of the impact assessments presented in **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.
Operation and Maintenance			
Disturbance from turbine noise	**WTG operation:** Continuous operation of the largest WTGs (44 WTGs) or smallest WTGs (60 WTGs), 24 hours a day, 7 days a week, over the Offshore Project lifetime of up to 35 years. **Rotor diameter:** • Largest WTGs: 238 m rotor diameter; • Smallest WTGs: 280 m rotor diameter.	Noise propagation estimated using the Tougaard *et al.* (2020) method, assuming an average wind speed of 11 m/s (see **Appendix 13.3, Volume 2c** for further detail).	The continuous operation of WTGs over a 35 year O&M period will generate a high level of operational noise, leading to the greatest propagation of noise into the water column, as defined in **Appendix 13.3, Volume 2c**) which has the potential to disturb marine mammals.
Disturbance from other operational noise	**O&M vessel movements and scheduled and unscheduled maintenance activities:** • **Vessel movements:** Continuous underwater noise generated by the movement of O&M vessels, assuming maximum number of vessels on site at any one time would be 10 over the Offshore Project lifetime of up to 35 years. Total maximum O&M vessels movements (return trips) is up to 32,034 over the 35 year operational lifetime; • **WTG foundations:** Scheduled inspections, geotechnical surveys, repairs and replacements of navigational equipment, removal of marine growth, replacement of corrosion protection	N/A	O&M vessel movements produce sustained, non-impulsive noise that can contribute to the ambient underwater soundscape over extended periods. Represents the maximum expected vessel traffic during O&M phases, over longest timeframe which has the potential to disturb marine mammals. Additionally, noise generated from scheduled and unscheduled maintenance activities also has the potential to disturb marine mammals, causing behavioural changes and displacement.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	anodes, painting, replacement of access ladders and boat landings, modifications to/replacement of J-tubes. Frequency of activities varying between rarely, as required, annually, to 10 times per year; • **WTGs:** Scheduled inspections, replacement of consumables, minor repairs and replacements within the WTG, major component replacement and painting or other coatings. Frequency of activities varying between infrequently, as required, annually, to 10 times per year; • **OSP foundations:** Removal of marine growth, replacement of corrosion protection anodes, painting, replacement of access ladders and boat landings and modifications to/replacement of J-tubes. Frequency of activities varying between rarely, as required, to 10 times per year; • **OSP:** Scheduled inspections, replacement of consumables and minor components, major component replacement and painting or other coatings. Frequency of activities varying between infrequently, as required, to 2 per year; • **Offshore Cables (Array or Export Cables):** Scheduled inspections, geotechnical surveys, offshore cable repair and replacement, offshore cable remediation (reburial/protection replacement). Frequency varying between 1 per year to up to 9 times across Offshore Project lifetime. • See **Table 3-21**, **Chapter 3, Volume 1a** for descriptions and frequency of each O&M activity.		
Vessel collision	**O&M vessel presence:** • Maximum number of vessels in the Offshore Project Boundary (208.2 km^2) at any one time is 10.	N/A	Represents maximum amount of O&M vessel traffic anticipated in the Offshore Project Boundary at any one time, presenting the greatest collision risk to marine mammals.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	• Total maximum O&M vessels movements (return trips) is up to 32,034 over the 35 year operational lifetime. Vessel types, maximum number of each type on site at any one time, and maximum number of return trips per year are outlined below (see **Chapter 3, Volume 1a** for further detail): • Crew transfer vessels/workboats, 31,850 trips; • Jack-up vessels, 140 trips; • Cable repair vessels, 12 trips; • Other vessels, 20 trips; • Excavators or backhoe dredger, 12 trips.		
Barrier effects	**Presence of up to 60 WTGs and 1 OSP (Scenario 1) and supporting HBG foundations within the Turbine Area (140 km^2):** • Minimum turbine spacing 900 m.	N/A	A greater number of WTG and WTG foundations in the water column produces the largest physical barrier effect, which may prevent or disrupt marine mammal access and passage.
Long-term changes in habitat and foraging opportunities	**Presence of up to 60 WTGs and Array Cables:** (Scenario 2) across the project lifetime of up to 35 years. Maximum long-term habitat loss = **2,411,500 m^2 (2.411 km^2)** **WTG:** • Up to 60 WTGs; • Hybrid Gravity Base (HGB) foundations; • Seabed footprint per WTG (including foundation area and scour protection) = 105 m x 105 m; • Maximum long-term seabed habitat loss of WTGs: (105 m x 105 m) x 60 = **661,500 m^2 (0.662 km^2)**. **Offshore Cables:** • Cable length: 12 Array Cables to Final WTG (within the Array Area) and 12 Array Cables to Landfall (within the OCAS) equating to a maximum cable length of 350 km; • Maximum corridor width = 5 m;	N/A	Represents the maximum number of WTGs, assuming the foundation type with the greatest seabed footprint and the maximum length of cables, and thus the greatest extent of long-term changes in seabed habitat loss upon which marine mammal prey species depend. The impacts of such changes on marine mammal receptors will be informed by the assessments of other chapters, including **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	• Maximum long-term seabed disturbance habitat loss for Array Cables: 350 km x 5m = **1,750,000 m^2 (1.75 km^2)**. Following the O&M phase, components of the Offshore Project may be left in-situ to avoid unnecessarily disturbing the seabed (i.e. where marine habitat has formed). This could include scour protection associated with the WTG foundations and sections of the Offshore Cable. The potential for infrastructure to remain in-situ will be confirmed through consultation on the Decommissioning Programme to ensure the most suitable approach is taken. At this stage it is unconfirmed which components (if any) would remain in-situ, however, under the maximum design scenario of long term seabed habitat loss/change it has been assumed that all WTG scour protection and the Array Cables would remain in-situ.		
Accidental release of pollutants	**O&M vessel presence:** • Maximum number of vessels in the Offshore Project Boundary (208.2 km^2) at any one time is 10; • Total maximum O&M vessels movements (return trips) is up to 32,034 over the 35 year operational lifetime. Vessel types, maximum number of each type on site at any one time, and maximum number of return trips per year are outlined below (see **Chapter 3, Volume 1a** for further detail): • Crew transfer vessels/workboats, 32,034 trips; • Jack-up vessels, 140 trips; • Cable repair vessels, 12 trips; • Other vessels, 20 trips; • Excavators or backhoe dredger, 12 trips.	N/A	Maximum number of O&M vessels on site at any one time presents the greatest risk of accidental pollution events to the marine environment, which could adversely impact marine mammals health and habitat.
Increases in suspended sediment concentration and reduction in water quality	**Scheduled and unscheduled maintenance activities:** • **WTG foundations:** Scheduled inspections, geotechnical surveys, repairs and replacements of navigational equipment,	N/A	**O&M phase maximum design scenario:** Maintenance activities are expected to occur with a lower intensity than those during construction. As such, construction activities are assumed to represent a maximum design scenario.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	removal of marine growth, replacement of corrosion protection anodes, painting, replacement of access ladders and boat landings, modifications to/replacement of J-tubes. Frequency of activities varying between rarely, as required, annually, to 10 times per year; • **WTGs:** Scheduled inspections, replacement of consumables, minor repairs and replacements within the WTG, major component replacement and painting or other coatings. Frequency of activities varying between infrequently, as required, annually, to 10 times per year; • **OSP foundations:** Removal of marine growth, replacement of corrosion protection anodes, painting, replacement of access ladders and boat landings and modifications to/replacement of J-tubes. Frequency of activities varying between rarely, as required, to 10 times per year; • **OSP:** Scheduled inspections, replacement of consumables and minor components, major component replacement and painting or other coatings. Frequency of activities varying between infrequently, as required, to 2 per year; • **Offshore Cables (Array or Export Cables):** Scheduled inspections, geotechnical surveys, offshore cable repair and replacement, offshore cable remediation (reburial/protection replacement). • For Array Cables frequency of reburial/protection and replacement up to 6 and 9 times, respectively, across Offshore Project lifetime.		No modelling has been done for SSC during the O&M phase, but levels are expected to be equal to or lower than during construction (see **Chapter 9, Volume 2a**). This is because the 'multiple activities' modelling scenario, during the construction phase, simulated a maximum suspended sediment concentration during drilling of 4 WTG foundations (each with 4 piles), and burial of cables (assuming drilling and cable burial activities happen sequentially) per month. It is not expected that such large-scale works will be undertaken during the O&M phase. Therefore, temporary increase in suspended sediment concentrations and sediment deposition during operation and maintenance will be of lower magnitude and frequency than that of construction.

Project phase and activity/impact	Maximum Design Scenario	Maximum assessment assumptions	Justification
	• See **Table 3-21**, **Chapter 3, Volume 1a** for descriptions and frequency of each O&M activity.		
Indirect effects of impacts on prey availability	Significant effects on prey species during the O&M phase of the Offshore Project, as determined by the impact assessments in **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.	N/A	Fish and invertebrate species are prey for marine mammals. Significant effects on prey species have the potential for indirect effects on marine mammals, therefore, this assessment has relied on the outputs of the impact assessments presented in **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.
Decommissioning			
Decommissioning activities	The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment, activities equivalent to or less than the construction phase. This is because, unlike construction, seabed clearance is not expected to be required for foundation installation or along cable routes. Any seabed clearance during decommissioning is likely to be limited to the placement of jack-up vessel legs. The assumptions for the construction phase therefore apply. Following the O&M phase, components of the Offshore Project may be left in-situ to avoid unnecessarily disturbing the seabed (i.e. where marine habitat has formed). This could include scour protection associated with the WTG foundations and sections of the Offshore Cable. The potential for infrastructure to remain in-situ will be confirmed through consultation on the Decommissioning Programme to ensure the most suitable approach is taken. At this stage it is unconfirmed which components (if any) would remain in-situ, however, under the maximum design scenario for decommissioning activities it has been assumed that all infrastructure above the seabed would be removed. **Decommissioning programme:** Maximum duration is up to 5 years.	N/A	**Construction phase maximum design scenario:** Decommissioning activities are expected to occur with a lower intensity than those during construction. As such, construction activities represent a maximum design scenario.

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13.7.2 EMBEDDED MITIGATION MEASURES

13.7.2.1 As part of the Offshore Project design process, a number of embedded mitigation measures have been adopted to reduce the potential for impacts on Marine Mammals and these have evolved over the development process as the EIA has progressed and in response to consultation.

13.7.2.2 The embedded mitigation measures also include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing the embedded mitigation, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and are set out in this EIAR.

13.7.2.3 **Table 13-25** sets out the relevant embedded mitigation measures within the design and how these affect the marine mammal's assessment. Embedded mitigation measures are considered to be primary and tertiary measures and exclude secondary mitigation.

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Table 13-25 Relevant Marine Mammals embedded mitigation measures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to Marine Mammals assessment
M002	A Cable Installation Plan will be produced to confirm routing, method of installation and aspects such as target Depth of Burial and need for/location of/type of external cable protection. This Plan will also contain the outputs of a formal Cable Burial Risk Assessment (CBRA). Data from the project-specific geophysical surveys will be used to identify the preferred route, with the use of natural crevasses or channels within the bedrock proposed, where feasible, and areas of thicker Quaternary sediments identified (to maximise opportunities for cable burial).	Pre-construction, construction	Secured in the Section 36 Consent and/or Marine Licence conditions. Details will be provided within the Cable Installation Plan.	Cable laying activities are anticipated to generate underwater noise, which has the potential to cause auditory injury or behavioural disturbance to marine mammals. In addition, these activities may increase levels of suspended sediment in the water column, potentially affecting water quality and benthic habitats and species (the latter of which could produce indirect effects on marine mammals). The cable laying plan will determine the methods to be used in order to minimise effects on ecological receptors.
M003	A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.	Pre-construction, construction, operation (including maintenance), and decommissioning	Secured in the Section 36 Consent and/or Marine Licence via the condition for an MMMP to be submitted to MD-LOT for approval.	Outlines best practice measures to avoid causing auditory injury to marine mammals from piling activity. This includes an MMO on board during noise generating activities to carry out visual monitoring and provide mitigation advice to vessel crews, and the hiring of a PAM operator to acoustically detect marine mammals within the mitigation zone and provide advice to vessel crews.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to Marine Mammals assessment
				The Outline and Final MMMP will also suggest a mitigation zone for monitoring during piling, and use of noise abatement systems, soft start and ramp-up procedures.
M004	Accidental release of construction material and/or litter to be addressed via the development of procedures to retrieve the accidental deposit of an object at sea.	Pre-construction, construction, operation (including maintenance), and decommissioning	To be secured through a condition of the Section 36 consent and/or Marine Licence.	Outlines best practice to avoid adverse effects on marine mammals from accidental pollution.
M005	Relevant best practice techniques for seabed excavations, employed through all phases of the Project, and suspended solids monitoring to aid responsible management of excavation activities.	Construction, operation (including maintenance), and decommissioning	To be secured through a condition of the Section 36 consent and/or Marine Licence.	Outlines best practice to avoid adverse effects on marine mammals from increased suspended solids and reduction in water quality.
M015	Compliance of all Offshore Project vessels with international marine regulations as adopted by the Flag State, notably the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1972/77) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974).	Pre-construction, construction, and decommissioning	To be secured through a condition of the Section 36 consent and/or Marine Licence.	Outlines vessel management procedures that will reduce the risk of collision with marine mammals.
M019	A final OEMP will be developed prior to commencement of construction (building on	Pre-construction, construction	Secured in the Section 36 Consent and/or	Project to develop an OEMP to define the mitigation measures and procedures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to Marine Mammals assessment
	Outline OEMP, Volume 3) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.		Marine Licence via the condition for an OEMP to be submitted to MD-LOT for approval.	relevant to environmental management during the construction phase. This also includes the creation of a Marine Pollution Contingency Plan (MPCP) to minimise potential impacts to marine mammals.
M020	A Decommissioning Plan will be developed prior to the construction of the Project in compliance with legislative requirements and/or best practice standards and guidance and adhered to.	Decommissioning	Secured in the Section 36 Consent and/or Marine Licence via the condition for a Decommissioning Plan to be submitted to MD-LOT for approval and the Energy Act 2004	Details methods used during this phase to remove offshore infrastructure, considering potential effects on marine mammal receptors.
M021	Adherence to requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78. Best practice techniques employed through all phases of the Project, and measures provided in a MPCP (see **MPCP, Volume 3**). All vessels associated with the Project will comply with International Maritime Organisation (IMO)/ Maritime and Coastguard Agency (MCA) codes for prevention of oil pollution and, where appropriate, will have onboard Shipboard Oil Pollution Emergency	Pre-construction, construction, operation (including maintenance), and decommissioning	Secured in the Section 36 Consent and/or Marine Licence conditions. Details will be provided within the MPCP	Outlines best practice to avoid adverse effects on marine mammals from accidental pollution.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to Marine Mammals assessment
	Plans (SOPEPs) (i.e. vessels over 400 gross tonnes (GT)).			
M025	A Final Operational & Maintenance Plan (OMP) (building on **Outline OMP**, **Volume 3**) will be developed in compliance with legislative requirements and/or best practice standards and guidance prior to the operation of the Project and adhered to.	Operation and maintenance	Secured in the Section 36 Consent and/or Marine Licence via the condition for an EMP to be submitted to MD-LOT for approval.	The Final OMP will outline the mitigation measures and procedures relevant to environmental management during the O&M phase. This will also include mitigation measures and procedures to minimise potential impacts to marine mammals.
M029	A Marine Coordination Centre will be established to monitor all vessel activity (Project, fishing and other maritime vessels), issue Notices to Mariners, and serve as a contact point for all maritime stakeholders.	Pre-construction, construction, and decommissioning	To be secured through a condition of the Section 36 consent and/or Marine Licence.	Outlines vessel management procedures that will reduce the risk of collision with marine mammals.
M031	A Marine Pollution Contingency Plan (MPCP) will be developed prior to commencement of construction (building on **MPCP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.	Design, pre-construction	Secured in the Section 36 Consent and/or Marine Licence via the condition for an MPCP to be submitted to MD-LOT for approval.	Provides a detailed risk assessment response plan for marine pollution events such as oil spills and methods for reducing impacts on marine animals, including marine mammals. This also includes the hiring of a spill response contractor to provide spill equipment, trained personnel and technical expertise, provides a tiered approach to

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to Marine Mammals assessment
				effectively manage environmental spills and minimise harm to the environment.

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13.8 ASSESSMENT OF EFFECTS: CONSTRUCTION PHASE

13.8.1 AUDITORY INJURY FROM PILING NOISE

13.8.1.1 Auditory injury may occur as a result of underwater noise generated through WTG or OSP foundation piling during the construction phase. Marine mammals are particularly sensitive to underwater noise and use sound for communication, foraging, predator detection, and navigation. The auditory injury from piling noise assessment is based on the worst-case piling scenario, and results from underwater noise modelling presented in **Appendix 13.3, Volume 2c** using the methodology outlined in Section 13.5.4. This is a precautionary approach because it assumes that the piling of any location within the Array Area will injure the same number of animals as predicted for Location 6.

13.8.1.2 The largest PTS impact ranges for marine mammals were predicted at Location 6, in the deep, northernmost waters. Location 6 therefore represents the worst-case scenario for auditory injury from piling noise. Full results for marine mammal impact ranges at all 6 locations can be found in **Appendix 13.3, Volume 2c.**

13.8.1.3 The maximum design scenario relating to auditory injury from piling noise during the construction phase is presented in **Table 13-24**.

Magnitude

13.8.1.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.1.5 The magnitude of impact is based on the criteria detailed in Section 13.5.3, Section 13.5.4 and **Chapter 5, Volume 1a**. A description of the likely magnitude of effect is given in the following paragraphs. This is presented separately for each hearing group, namely: very-high frequency cetaceans (VHF), high-frequency cetaceans (HF), low-frequency cetaceans (LF), and phocid carnivores in water (PCW).

Very-high-frequency cetaceans

13.8.1.6 **Table 13-26** gives the maximum range and area within the PTS-onset contour for VHF cetaceans, and the number of affected animals (based on uniform density estimates in **Table 13-18**) at the worst-case piling location (Location 6). While the Offshore Project has made a commitment to ensuring a noise level reduction of 12 dB (**Appendix 3.1, Volume 1c**), numbers of injured animals have also been calculated in the absence of this mitigation and are presented here, to demonstrate the reduced effects on marine mammals, from applying this level of noise abatement mitigation.

13.8.1.7 Results show that, with the 12 dB mitigation applied, the number of harbour porpoises receiving PTS is less than 1, which represents less than 0.01% of the UK population.

Table 13-26 Summary of results for instantaneous and cumulative PTS for the VHF Hearing Group for piling worst case (Location 6)

VHF Hearing Group	Instantaneous PTS (SPL_{peak}, dB re 1µPa)		Cumulative PTS (SEL_{cum}, dB re 1µPa^{2}s)	
	Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**
Max. range	840 m	150 m	6,300 m	<100 m
Area	2.18 km^2	0.06 km^2	86.00 km^2	<0.01 km^2
Harbour porpoise West Scotland MU				
No. animals	3	<1	120	<1
% UK MU pop.	0.01	<0.01	0.49	<0.01

High-frequency cetaceans

13.8.1.8 **Table 13-27** gives the maximum range and area within the PTS-onset contour for HF cetaceans, and the number of affected animals (based on uniform density estimates in **Table 13-18**) at the worst-case piling location (Location 6). While the Offshore Project has made a commitment to ensuring a noise level reduction of 12 dB (**Appendix 3.1, Volume 1c**), numbers of injured animals have also been calculated in the absence of this mitigation and are presented here, to demonstrate the effects on marine mammals, from applying this level of noise abatement mitigation.

13.8.1.9 Results show that, both with and without the 12 dB mitigation applied, the number of animals receiving PTS is less than 1 across all receptors, which represents less than 0.01% of the UK population of each receptor (where population information is available).

Table 13-27 Summary of results for instantaneous and cumulative PTS for the HF Hearing Group for piling worst case (Location 6)

HF Hearing Group	Instantaneous PTS (SPL_{peak}, dB re 1µPa)		Cumulative PTS (SEL_{cum}, dB re 1µPa^{2}s)	
	Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**
Max. range	<100 m	<50 m	100 m	<50 m
Area	<0.01 km^2	<0.01 km^2	<0.10 km^2	<0.01 km^2
White-beaked dolphin Celtic and Greater North Seas MU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Common dolphin Celtic and Greater North Seas MU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Bottlenose dolphin Coastal West Scotland and Hebrides MU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Bottlenose dolphin Oceanic Waters MU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Risso's dolphin Celtic and Greater North Seas MU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Atlantic white-sided dolphin Celtic and Greater North Seas MU				

HF Hearing Group	Instantaneous PTS (SPL_{peak}, dB re 1μPa)		Cumulative PTS (SEL_{cum}, dB re 1μPa²s)	
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Long-finned pilot whale no MU				
No. animals	<1	<1	<1	<1
Killer whale no MU				
No. animals	<1	<1	<1	<1
Beaked whale species no MU				
No. animals	<1	<1	<1	<1

Low-frequency cetaceans

13.8.1.10 **Table 13-28** gives the maximum range and area within the PTS-onset contour for LF cetaceans, and the number of affected animals (based on uniform density estimates in **Table 13-18** and the modelled density surface estimate for fin whale, as no DAS or SCANS estimates were available for this species) at the worst-case piling location (Location 6). While the Offshore Project has made a commitment to ensuring a noise level reduction of 12 dB (**Appendix 3.1, Volume 1c**), numbers of injured animals have also been calculated in the absence of this mitigation and are presented here, to demonstrate the effects on marine mammals, from applying this level of noise abatement mitigation.

13.8.1.11 Results show that, with the 12 dB mitigation applied, the number of animals receiving PTS is less than 1 for minke whale, which represents less than 0.01% of the UK population. The number of fin whales receiving PTS is also less than one, though no UK population information is available for this species. No density or population estimates are available for humpback whales (thus no results are presented, though the species is included in this table for completeness).

Table 13-28 Summary of results for instantaneous and cumulative PTS for the LF Hearing Group for piling worst case (Location 6)

LF Hearing Group	Instantaneous PTS (SPL_{peak}, dB re 1μPa)		Cumulative PTS (SEL_{cum}, dB re 1μPa²s)	
	Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**
Max. range	80 m	<50 m	34,000 m	1,500 m
Area	0.02 km²	<0.01 km²	1,600.00 km²	3.00 km²
Minke whale Celtic and Greater North Seas MU				
No. animals	<1	<1	67	<1
% UK MU pop.	<0.01	<0.01	0.65	<0.01
Fin whale no MU				
No. animals	<1	<1	40	<1
Humpback whale no density estimates, no MU				

Phocid carnivores in water

13.8.1.12 **Table 13-29** gives the maximum range and area within the PTS-onset contour for PCW cetaceans, and the number of affected animals (based on uniform density estimates in **Table 13-29** at the worst-case piling location (Location 6). While the Offshore Project has made a commitment to ensuring a noise level reduction of 12 dB (**Appendix 3.1, Volume 1c**), numbers of injured animals have also been calculated in the absence of this mitigation and are presented here, to demonstrate the effects on marine mammals, from applying this level of noise abatement mitigation.

13.8.1.13 Results show that, both with and without the 12 dB mitigation applied, the number of animals receiving PTS is less than 1 for each receptor, which represents less than 0.01% of the UK population of each receptor.

Table 13-29 Summary of results for instantaneous and cumulative PTS for the PCW Hearing Group for piling worst case (Location 6)

PCW Hearing Group	**Instantaneous PTS (SPL_{peak}, dB re 1µPa)**		**Cumulative PTS (SEL_{cum}, dB re 1µPa^{2}s)**	
	Unmitigated	**Mitigated**	**Unmitigated**	**Mitigated**
Max. range	90 m	<50 m	<100 m	<100 m
Area	0.02 km^2	<0.01 km^2	<0.10 km^2	0.01 km^2
Grey seal Western Isles SMU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01
Harbour seal Western Isles SMU				
No. animals	<1	<1	<1	<1
% UK MU pop.	<0.01	<0.01	<0.01	<0.01

Summary

13.8.1.14 As can be seen from the results in the above tables, the application of noise abatement mitigation (see **Appendix 3.1, Volume 1c**) prevents any animals from receiving auditory injuries (PTS), with harbour porpoise in the West Scotland MU, minke whale in the Celtic and Greater North Seas MU and fin whale (no MU) the only species where some animals would be injured in the absence of noise abatement mitigation. As a result of no animals being affected, iPCoD was not run for any of the 5 species for which parameters are available (because the model requires at least 1 whole animal to be affected in order to investigate any population-level affect).

13.8.1.15 A lack of density estimates for humpback whales has meant this species can only be assessed qualitatively. Humpback whale is a baleen whale in the LF marine mammal hearing group and, as a result, is most comparable with the minke whale. Given that no minke whales are predicted to receive an auditory injury, an assumption can be made that humpback whale, lower in density than minke whale, would also not be predicted to receive an auditory injury.

13.8.1.16 In summary, the magnitude of the impact of piling noise on auditory injury for all receptors is considered to be **Negligible.** This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population and very short-term effect and no changes to population size or future trajectory.

Sensitivity or value of receptor

13.8.1.17 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High value receptors

13.8.1.18 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Very-high-frequency cetaceans

13.8.1.19 Harbour porpoises are widely regarded as the most sensitive marine mammal receptor to underwater noise. As VHF cetaceans, they have a substantially higher upper-frequency hearing limit than HF cetaceans, with hearing capabilities of 275-160 kHz (NMFS, 2018; Southall *et al.*, 2019). Harbour porpoise hearing is most sensitive at frequencies between 16 kHz and 140 kHz, with maximum sensitivity occurring at 105-125 kHz (Kastelein *et al.*, 2015; 2017). Piling noise is typically 30-500 Hz, peaking between 100 and 300 Hz. Exposure to pile driving noise induces TTS in a narrow frequency band, with significant threshold shift occurring at 4 and 8 kHz (Kastelein *et al.*, 2016). The overlap in frequencies between piling noise and harbour porpoise hearing makes the species vulnerable to auditory injury. However, noise with the potential to cause auditory injury tends to be limited to the area in the vicinity of the pile. Harbour porpoise presence has been reported to decrease in the hours prior to pile driving, due to an increase in vessel traffic (Benhemma-Le Gall *et al.*, 2023). This may act as an early deterrent where porpoise avoid the area due to vessel presence and remain absent during piling, which reduces the potential for injury (Brant *et al.*, 2018). Harbour porpoises have however, been reported to become habituated to underwater noise from pile driving (Graham *et al.*, 2019), suggesting that they may spend prolonged amounts of time in areas subjected to underwater noise, which may still cause auditory injury.

High-frequency cetaceans

13.8.1.20 HF cetacean species are listed within **Table 13-13** and have a lower upper-frequency hearing limit than VHF cetaceans and are generally less sensitive to underwater noise. Within the HF cetacean group, bottlenose dolphins are the most studied species, given their regular occurrence and coastal distribution (Thompson *et al.*, 2011; Southall *et al.*, 2019). There are limited data available on other species, including white-beaked dolphins, common dolphins and Risso's dolphins. Bottlenose dolphin is therefore used as a proxy for other HF delphinids.

13.8.1.21 HF cetaceans have an auditory range of approximately 150-160 kHz (Southall *et al.*, 2019) and the highest sensitivity of delphinids, including bottlenose dolphin, white-beaked dolphin, common dolphin and Risso's dolphin, ranges from 8.8-110 kHz.

13.8.1.22 Within the HF hearing group, a potential further segregation is proposed for species which may have a higher sensitivity to lower frequencies and could have hearing ranges which more align with mid-frequency cetaceans, particularly at lower frequencies (Southall *et al.*, 2019). The species in this category which are included in this assessment include killer whales and beaked whale species. There is relatively little information on beaked whale hearing ranges, however studies indicate a relatively broad range of hearing sensitivity below 5 kHz. Killer whales are also believed to have a broad hearing range and good hearing at low frequencies compared to other species in the HF group. Killer whales and beaked whale species, while having a hearing range which covers higher frequencies, may be less sensitive to piling noise.

Low-frequency cetaceans

13.8.1.23 LF cetaceans include all the baleen whales (mysticetes) (**Table 13-13**). LF noise produced during pile driving has potential to overlap with the hearing ranges of minke, humpback and fin whales. There are limited studies investigating the effect of pile driving on humpback and fin whale, given their lower density in comparison to minke whale in UK waters. There is also still relatively little known about minke whale hearing, however recent studies carried out by the US National Marine Mammal Foundation, the Norwegian Defence Research Establishment, and LKARTS-Norway have further developed understanding of minke whale hearing ranges. As LF cetaceans, the minke whale generalised hearing range is 7-36 kHz (Southall *et al.*, 2019), however the recent study carried out in 2024 has suggested that minke whales are sensitive to frequencies as high as 45-90 kHz, with their best hearing at approximately 32 kHz (Houser *et al.*, 2024).

13.8.1.24 Within the LF group, there is potential for segregation into a very-low-frequency (VLF) group, with species potentially including the larger whales, including fin whale, which specialise in particularly low frequency sound (Southall *et al.*, 2019). VLF cetaceans could be distinguished from LF species, such as minke and humpback whales, which more commonly use higher frequencies. However, for now, they remain within the LF hearing group.

13.8.1.25 It is assumed that for minke, humpback and fin whales, suffering an auditory injury would bring effects on the health and vital rates of individuals. The hearing ranges of minke, humpback and fin whales overlap with that of piling noise, and at present there is insufficient evidence to distinguish between LF (minke and humpback whales) and VLF (fin whales) auditory weighting functions or TTS and PTS onset values (Southall *et al.*, 2019). Piling noise is typically 30-500 Hz, peaking between 100 and 300 Hz, which overlaps with the estimated hearing ranges of LF cetacean species.

Phocid carnivores in water

13.8.1.26 Seals fall into the phocid carnivores in water (PCW) hearing group (Southall *et al.*, 2019) and use sound for communication, foraging and predator avoidance, however, are less dependent on sound for foraging compared to cetaceans and use alternative methods such as tactile senses (Deecke *et al.* 2002). Seal hearing sensitivity is highest between 12 and 140 kHz, with peak hearing at approximately 13 kHz. Grey and harbour seals have comparable audiograms and life histories, and vocalisation ranges are similar (Booth and Heinis, 2018).

13.8.1.27 Seals are considered vulnerable to auditory injury due to the high levels of site fidelity to haul-out, moulting and breeding sites (SCOS, 2022), and seals may endure piling noise near these areas. Seals are likely to remain in preferred haul-out areas despite piling noise, as the motivation to choose another area is often less than the desire to remain, with a multitude of unknown factors influencing an individual's decision, such as prey availability, predators, disturbance and conspecific competition. Hearing is an important sense for foraging efficiency of seals, and auditory injury may influence foraging success and body condition, and thus it could affect fertility of grey and harbour seals (Booth and Heinis, 2018).

13.8.1.28 Despite the overlap in hearing sensitivity and underwater noise generated by piling, the probability of PTS significantly affecting survival or reproduction of seals is low (Booth and Heinis, 2018). It is unlikely that communication would be impacted, as most vocalisations are below 2 kHz, and a narrowband reduction in hearing sensitivity is also unlikely to affect seal survival. Post-PTS survival may be affected by a reduced ability to hear predators, such as vocalising killer whales, or dogs when hauled out, or bring increased vulnerability to vessel collision.

13.8.1.29 Despite seals being sensitive to underwater noise generated by piling operations, studies have suggested that seals are present at offshore wind farm sites during piling activities. Grey seals have been recorded travelling to areas which were exposed to noise generated from pile driving, and repeatedly returning to the vicinity on subsequent trips, from which they received multiple exposures. This may be due to higher or more valuable prey availability, and the seals perceiving the prey as a higher priority than the sound exposure, accepting the risk of auditory injury, rather than foraging elsewhere. Harbour seals have also been reported to remain in areas in which PTS would occur, with one study estimating that half of seals studied exceeded permanent auditory damage thresholds when travelling within 4.7 km of offshore piling activities (Hastie *et al.*, 2015). Recent updates to PTS threshold weighted functions have since estimated the PTS threshold for PCW at 2 km, compared to previous estimates of 10 km for a theoretical scenario involving pile driving 24-h SEL_{cum} at offshore wind farms in the North Sea (Whyte *et al.*, 2020).

Summary

13.8.1.30 To summarise, considering that cetaceans and pinnipeds are highly adapted to a life at sea and that cetaceans especially have developed highly complex vocalisation behaviours, and despite the assumption that marine mammals would flee in response to construction noise, all marine mammal receptors are considered to have some vulnerability to auditory injury from piling noise. Additionally, marine mammals are internationally protected, as EPS (all cetaceans) and/or by means of SAC designation to promote their conservation (grey and harbour seals, harbour porpoise and bottlenose dolphin).

13.8.1.31 As such, from a precautionary perspective, the sensitivity of all marine mammal receptors is considered to be **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.8.1.32 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the development of an OEMP (M019), alongside adherence to a MMMP (M003) to reduce the auditory injury from piling noise. Overall, it is predicted that the magnitude impact of auditory injury from piling noise on Marine Mammals is **Negligible**, and the sensitivity is **Medium**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.1.33 Given the predicted extent of <50 m for the instantaneous and cumulative PTS noise contours for HF cetaceans, the likelihood of auditory injury to Risso's dolphins in the North-east Lewis MPA, over 20 km to the northeast of the Array Area, is negligible. It is therefore considered that piling noise during the Project's construction phase is not capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of auditory injury, either directly or indirectly.

Sea of the Hebrides MPA

13.8.1.34 Given the predicted extent of <50 m for the instantaneous and max. 1,500 m cumulative PTS noise contours for LF cetaceans, the likelihood of auditory injury to minke whales in the Sea of the Hebrides MPA, over 80 km to the south of the Array Area, is negligible. It is therefore considered that piling noise during the Project's construction phase is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA in terms of auditory injury, either directly or indirectly.

13.8.2 DISTURBANCE FROM PILING NOISE

13.8.2.1 Disturbance may occur as a result of underwater noise generated through WTG or OSP foundation piling during the construction phase. Marine mammals are particularly sensitive to underwater noise and use sound for communication, foraging, predator detection, and navigation. Disturbance from piling noise assessment is based on the worst-case piling scenario, and results from underwater noise modelling presented in **Appendix 13.3, Volume 2c**, using the methodology outlined in Section 13.5.3.

13.8.2.2 The maximum design scenario relating to disturbance from piling noise during the construction phase is presented in **Table 13-24**.

13.8.2.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.2.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11.**

13.8.2.5 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**), which includes relevant mitigation relating to effects on marine mammal receptors from pile driving. Examples of embedded mitigation measures include the implementation of an OEMP (M019) and MMMP (M003) (see **Table 13-25**), both of which contribute to minimising the effects of underwater noise from pile driving during the construction phase. This section presents the numbers of disturbed animals and the iPCoD modelling results per species (where available), at the worst-case piling location: Location 6, based on modelled density surface estimates and using a dose-response function, as described in Section 13.5.4. This is a highly precautionary approach because it assumes that the piling of any location within the Array Area will disturb the same number of animals per day as predicted for Location 6.

Harbour porpoise (West Scotland Management Unit)

13.8.2.6 Results of the assessment of disturbance on harbour porpoise in the West Scotland MU show that 1,040 animals are predicted to be disturbed by piling noise at Location 6. This number equates to 4.3% of the population size of this MU. **Figure 13.13, Volume 2b** displays the worst-case piling scenario noise contours and predicted disturbance response for harbour porpoise (VHF cetaceans) within the West Scotland MU.

13.8.2.7 iPCoD modelling was undertaken for the West Scotland MU harbour porpoise population for the Offshore Project alone and is provided within **Appendix 13.4, Volume 2c**. Results of iPCoD modelling for un-impacted and impacted populations of harbour porpoise in the West Scotland MU show that the mean impacted population size remains at 99.97-99.76% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-30** presents the mean un-impacted and impacted population sizes for the West Scotland MU for harbour porpoise. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 99.83% of the size of the un-impacted population, which means that disturbance has resulted in a 0.17% change in mean population size.

Table 13-30 Mean un-impacted and impacted population sizes for the West Scotland MU for harbour porpoise from iPCoD modelling

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2030 (pre-piling)	24,304	24,304	100%
End 2030 (end piling year 1)	24,291	24,284	99.97%
End 2031 (end piling year 2)	24,263	24,222	99.83%
End 2032 (1 year after piling ends)	24,289	24,231	99.76%
End 2037 (6 years after piling ends)	24,150	24,109	99.83%
End 2043 (12 years after piling ends)	24,222	24,181	99.83%
End 2049 (18 years after piling ends)	24,196	24,155	99.83%

White-beaked dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.8.2.8 Results of the assessment of disturbance on white-beaked dolphin in the UK portion of the Celtic and Greater North Seas MU show that 646 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 1.90% of the UK population size of this MU. **Figure 13.14, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for white-beaked dolphin in this MU.

13.8.2.9 No parameters for iPCoD modelling exist for this species. White-beaked dolphins are widely distributed and were the third most frequently recorded delphinid in PAM surveys for the Offshore Project, although there has been a decline in observations in the Minch/*Mhaoil* since the 1990s, coinciding with an increase in common dolphin sightings. In the absence of population modelling, the future trajectories of the species are unknown, given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources. However, considering the low proportion of the UK population predicted to be disturbed, population-level effects are considered to be highly unlikely.

Common dolphin (Celtic and Greater North Seas Management Unit – UK portion).

13.8.2.10 Results of the assessment of disturbance on common dolphin in the UK portion of the Celtic and Greater North Seas MU show that 2 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 0.003% of the UK population size of this MU. **Figure 13.15, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for common dolphin in this MU.

13.8.2.11 No parameters for iPCoD modelling exist for this species. Common dolphins are wide-ranging and present throughout the northeast Atlantic. Common dolphins are generally a summer visitor to the west coast of Scotland/*Alba* but their presence in PAM surveys for the Offshore Project was low. In the absence of population modelling, and with such a low proportion of the UK population likely to be affected, it is anticipated that both the impacted and un-impacted populations will continue on their trajectories and that any decrease in the mean population size as a result of disturbance will be minimal.

Bottlenose dolphin (Coastal West Scotland and Hebrides Management Unit)

13.8.2.12 Results of the assessment of disturbance on bottlenose dolphin in the Coastal West Scotland and Hebrides MU show that 12 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 27.7% of the population size of this MU. **Figure 13.16, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for bottlenose dolphin in this MU.

13.8.2.13 iPCoD modelling was undertaken for the Coastal West Scotland and Hebrides MU bottlenose dolphin population for the Offshore Project alone. The mean impacted population size remains at 100-95.45% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-31** presents the mean un-impacted and impacted population sizes for the Coastal West Scotland and Hebrides MU for bottlenose dolphin. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 97.67% of the size of the un-impacted population, which means that disturbance has resulted in a 2.33% change in mean population size.

Table 13-31 Mean un-impacted and impacted population sizes for the Coastal West Scotland and Hebrides MU for bottlenose dolphin from iPCoD modelling

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2030 (pre-piling)	44	44	100%
End 2030 (end piling year 1)	44	44	100%
End 2031 (end piling year 2)	44	43	97.73%
End 2032 (1 year after piling ends)	44	42	95.45%
End 2037 (6 years after piling ends)	44	43	97.73%
End 2043 (12 years after piling ends)	44	42	95.45%
End 2049 (18 years after piling ends)	43	42	97.67%

Bottlenose dolphin (Oceanic Waters Management Unit)

13.8.2.14 Results of the assessment of disturbance on bottlenose dolphin in the Oceanic Waters MU show that 21 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 1.63% of the population size of this MU. **Figure13.17, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for bottlenose dolphin in this MU.

13.8.2.15 iPCoD modelling was undertaken for the Oceanic Waters MU bottlenose dolphin population for the Offshore Project alone. The mean impacted population size remains at 100-99.92% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-32** presents the mean un-impacted and impacted population sizes for the Oceanic Waters MU for bottlenose dolphin. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 99.92% of the size of the un-impacted population, which means that disturbance has resulted in a 0.08% change in mean population size.

Table 13-32 Mean un-impacted and impacted population sizes for the Oceanic Waters MU for bottlenose dolphin from iPCoD modelling

Year	**Mean un-impacted population size**	**Mean impacted population size**	**Mean impacted population size as a proportion of the mean un-impacted population size**
Start 2030 (pre-piling)	1,298	1,298	100%
End 2030 (end piling year 1)	1,297	1,297	100%
End 2031 (end piling year 2)	1,299	1,298	99.92%
End 2032 (1 year after piling ends)	1,297	1,296	99.92%
End 2037 (6 years after piling ends)	1,293	1,292	99.92%
End 2043 (12 years after piling ends)	1,296	1,295	99.92%
End 2049 (18 years after piling ends)	1,289	1,288	99.92%

Risso's dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.8.2.16 No fine-spatial-scale modelled density surface estimates were available for Risso's dolphin and the assessment was therefore based on a uniform density estimate from SCANS-III block J. As discussed in Section 13.5.3, this is likely to overestimate numbers, when compared with using fine-scale GIS data.

13.8.2.17 Results of the assessment of disturbance on Risso's dolphin in the UK portion of the Celtic and Greater North Seas MU show that 798 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 9.186% of the UK population size of this MU. **Figure 13.18, Volume 2b** displays noise contours for HF cetaceans and, in the absence of modelled density surfaces from Lacey *et al.* (2022), a uniform density estimate from SCANS-III block J has been used within those contours for common dolphin in this MU, which provides an overly precautionary estimate.

13.8.2.18 No parameters for iPCoD modelling exist for this species Risso's dolphin are present throughout the west coast of Scotland/*Alba*, year-round and, although they are a protected feature of the North-east Lewis MPA, they were not regularly recorded in DAS and were the least frequently recorded delphinid in PAM surveys for the Offshore Project. In the absence of population modelling, the future trajectories of the species are unknown, given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources. It is, however, anticipated that, especially given the precautionary nature of the results, effects on the population size as a result of disturbance will be minimal.

Atlantic white-sided dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.8.2.19 No fine-spatial-scale modelled density surface estimates were available for Atlantic white-sided dolphin and the assessment was therefore based on a uniform density estimate from SCANS-IV block CS-J. As discussed in Section 13.5.3, this is likely to overestimate numbers, when compared with using fine-scale GIS data.

13.8.2.20 Results of the assessment of disturbance on Atlantic white-sided dolphin in the UK portion of the Celtic and Greater North Seas MU show that 97 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 0.789% of the UK population size of this MU. **Figure 13.19, Volume 2b** displays noise contours for HF cetaceans and, in the absence of modelled surface densities from Lacey *et al.* (2022), a uniform density estimate from SCANS-IV block CS-J has been used within those contours for common dolphin in this MU.

13.8.2.21 No parameters for iPCoD modelling exist for this species. Atlantic white-sided dolphins are present on the west coast of Scotland/Alba, moving inshore during the summer months and were regularly detected in PAM surveys for the Offshore Project. In the absence of population modelling, the future trajectories of the species are unknown, given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources. It is, however, anticipated that effects on the population size as a result of disturbance will be minimal.

Long-finned pilot whale (no management unit)

13.8.2.22 Results of the assessment of disturbance on long-finned pilot whale show that 202 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. There is no management unit for pilot whale, therefore, no percentage of the UK population can be calculated. **Figure 13.20, Volume 2b** displays noise contours for HF cetaceans and modelled density surface estimates from Lacey *et al.* (2022) within those contours for pilot whale.

13.8.2.23 No parameters for iPCoD modelling exist for this species. In the absence of population modelling, the future trajectories of the species are unknown, given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources. Deep waters to the north of Scotland/*Alba* have one of the highest numbers of pilot whales and they are also often recorded off the west coast, though there was a generally low rate of detection in PAM surveys for the Offshore Project. It is therefore anticipated that effects on the population size as a result of disturbance will be minimal.

Killer whale (no management unit)

13.8.2.24 No fine-spatial-scale modelled density surface estimates were available for killer whale. As discussed in Section 13.5.3, use of a uniform density is likely to overestimate numbers of disturbed animals, when compared with using fine-scale GIS data. In the case of killer whale, use of the DAS peak density from January 2023 of 0.06 produces a result of 277 animals. This makes little ecological sense here, given the maximum sizes of the well documented West Coast and North Coast Communities, as well as those from nearby areas. Killer whales also have no management unit and no iPCoD parameters and the receptor is therefore assessed here qualitatively.

13.8.2.25 Studies on abundance and distribution are limited. Killer whales are occasionally sighted off the west coast of Scotland/*Alba*, with most of these being of the West Coast Community, containing just 2 recently seen males but up to a possible 8 individuals. This community has a reducing population. However, given that this community also mobilises to waters off the coasts of Ireland, Wales, England and the east coast of Scotland/*Alba*, it is anticipated that effects on the population size as a result of disturbance will be minimal. **Figure 13.21, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for killer whale.

Beaked whale species (no management unit)

13.8.2.26 Results of the assessment of disturbance on beaked whale species show that 17 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. There are no management units for beaked whale species, therefore, no percentage of the UK population can be calculated. **Figure 13.22, Volume 2b** displays noise contours for HF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for beaked whale species.

13.8.2.27 No parameters for iPCoD modelling exist for this species. Beaked whale species prefer deep continental slope habitats, with some features also found around the Hebrides/*Na h-Eileanan Sia*, which some beaked whales may use. Beaked whale species, however, were not recorded in DAS or PAM surveys for the Offshore Project. It is therefore anticipated that effects on the population size as a result of disturbance will be minimal.

Minke whale (Celtic and Greater North Seas Management Unit – UK portion)

13.8.2.28 Results of the assessment of disturbance on minke whales in the UK portion of the Celtic and Greater North Seas MU show that 65 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 0.63% of the UK population size of this MU. **Figure 13.23, Volume 2b** displays noise contours for LF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for minke whale.

13.8.2.29 iPCoD modelling was undertaken for the Celtic and Greater North Seas MU minke whale UK population for the Offshore Project alone. The mean impacted population size remains at 100% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-33** presents the mean un-impacted and impacted population sizes for the UK portion of the Celtic and Greater North Seas MU for minke whale. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 100% of the size of the un-impacted population, which means that disturbance has resulted in a 0% change in mean population size.

Table 13-33 Mean un-impacted and impacted population sizes for the UK portion of the Celtic and Greater North Seas MU for minke whale from iPCoD modelling

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2030 (pre-piling)	10,288	10,288	100%
End 2030 (end piling year 1)	10,289	10,289	100%
End 2031 (end piling year 2)	10,282	10,282	100%
End 2032 (1 year after piling ends)	10,259	10,259	100%
End 2037 (6 years after piling ends)	10,215	10,215	100%
End 2043 (12 years after piling ends)	10,175	10,175	100%
End 2049 (18 years after piling ends)	10,186	10,186	100%

Humpback whale (no management unit)

13.8.2.30 Results of the assessment of disturbance on humpback whale have necessitated a qualitative approach, in the absence of either modelled density surface estimates from Lacey *et al*. (2022) or any uniform density estimate from SCANS surveys or DAS. **Figure 13.24, Volume 2b** displays noise contours for LF cetaceans. Humpback whale song was, however, recorded on PAM surveys for the Offshore Project, with a clear seasonal pattern of song between early February and mid-April, aligning with previously published work (van Geel *et al.*, 2022).

13.8.2.31 No parameters for iPCoD modelling exist for this species. The lack of data on abundance and distribution in the area is likely to their low numbers. Given this fact and the seasonality of PAM data, it is anticipated that any effect on humpback populations from disturbance will be minimal.

Fin whale (no management unit)

13.8.2.32 Results of the assessment of disturbance on fin whales show that 8 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. There are no management units for fin whale, therefore, no percentage of the UK population can be calculated. **Figure 13.25, Volume 2b** displays noise contours for LF cetaceans and modelled density surfaces from Lacey *et al.* (2022) within those contours for fin whale.

13.8.2.33 No parameters for iPCoD modelling exist for this species. Fin whales prefer deeper continental shelf edge waters and most records in the region are to the east of Lewis and throughout the Minch. No fin whales were recorded from DAS or PAM surveys for the Offshore Project. It is therefore anticipated that effects on the population size as a result of disturbance will be minimal.

Grey seal (Western Isles Seal Monitoring Unit)

13.8.2.34 Results of the assessment of disturbance on grey seal in the Western Isles SMU show that 83 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 0.27% of the population size of this MU. **Figure 13.26, Volume 2b** displays noise contours for PCW and seal habitat-based distribution estimates from Carter *et al.* (2022) within those contours for grey seal in this SMU.

13.8.2.35 iPCoD modelling was undertaken for the Western Isles SMU grey seal population for the Offshore Project alone. The mean impacted population size remains at 100% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-34** presents the mean un-impacted and impacted population sizes for the Western Isles SMU for grey seal. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 100% of the size of the un-impacted population, which means that disturbance has resulted in a 0% change in mean population size.

Table 13-34 Mean un-impacted and impacted population sizes for the Western Isles SMU for grey seal from iPCoD modelling

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2030 (pre-piling)	30,998	30,998	100%
End 2030 (end piling year 1)	31,259	31,259	100%
End 2031 (end piling year 2)	31,386	31,386	100%
End 2032 (1 year after piling ends)	31,618	31,618	100%
End 2037 (6 years after piling ends)	32,740	32,740	100%
End 2043 (12 years after piling ends)	34,029	34,029	100%
End 2049 (18 years after piling ends)	35,202	35,202	100%

Harbour seal (Western Isles Seal Monitoring Unit)

13.8.2.36 Results of the assessment of disturbance on harbour seal in the Western Isles SMU show that 11 animals are predicted to be disturbed by piling noise at Location 6, which presents the worst-case scenario for piling. This number equates to 0.22% of the population size of this SMU. **Figure 13.27, Volume 2b** displays noise contours for PCW and seal habitat-based distribution estimates from Carter *et al.* (2022) within those contours for harbour seal in this SMU.

13.8.2.37 iPCoD modelling was undertaken for the Western Isles SMU harbour seal population for the Offshore Project alone. The mean impacted population size remains at 100% of the size of the un-impacted population mean and is predicted to continue on a stable trajectory, the same as the un-impacted population. **Table 13-35** presents the mean un-impacted and impacted population sizes for the Western Isles SMU for harbour seal. The results indicate that by the end of 2049 (18 years after piling ends), the impacted population is predicted to be at 100% of the size of the un-impacted population, which means that disturbance has resulted in a 0% change in mean population size.

Table 13-35 Mean un-impacted and impacted population sizes for the Western Isles SMU for harbour seal from iPCoD modelling

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2030 (pre-piling)	4,902	4,902	100%
End 2030 (end piling year 1)	4,903	4,903	100%
End 2031 (end piling year 2)	4,902	4,902	100%
End 2032 (1 year after piling ends)	4,906	4,906	100%
End 2037 (6 years after piling ends)	4,892	4,892	100%
End 2043 (12 years after piling ends)	4,927	4,927	100%
End 2049 (18 years after piling ends)	4,939	4,939	100%

Summary

13.8.2.38 In summary of the above results, the magnitude of the impact of piling noise on disturbance of marine mammal receptors is considered to be **Low** for bottlenose dolphins in the Coastal West Scotland and Hebrides MU. This is based on the guidelines for magnitude which states that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population. Risso's dolphin are also classed as **Low** as a precautionary estimate; given that a proportionally low number of individuals within the population will be affected, it is unlikely to compromise the long-term viability of the population.

13.8.2.39 **Table 13-36** summaries the magnitude of effect on cetacean and seal species from the assessment of disturbance from piling noise. The magnitude of impact is considered to be **Negligible** for all other species (**Table 13-36**). This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population and very short-term effect and no changes to population size or future trajectory. The assessment guidelines for magnitude are presented within **Table 13-11**.

Table 13-36 Summary of magnitude of effect on cetacean and seal species from the assessment of disturbance from piling noise (* denotes a highly precautionary estimate, in the absence of fine-scale surface densities)

Species	MU/SMU	No. animals disturbed or qualitative assessment	% population disturbed or qualitative assessment	% change in mean population size at 18 years after piling ends (iPCoD) or qualitative assessment	Magnitude of effect
Harbour porpoise	WS	1,040	4.300	0.17	Negligible
White-beaked dolphin	CGNS	646	1.900	Minimal	Negligible
Common dolphin	CGNS	2	0.003	Minimal	Negligible
Bottlenose dolphin	CWSH	12	27.700	2.33	Low
Bottlenose dolphin	OW	21	1.630	0.08	Negligible
Risso's dolphin	CGNS	798*	9.186	Minimal	Low
Atlantic white-sided dolphin	CGNS	97*	0.789	Minimal	Negligible
Long-finned pilot whale	None	202	Minimal	Minimal	Negligible
Killer whale	None	Minimal	Minimal	Minimal	Negligible
Beaked whale species	None	17	Minimal	Minimal	Negligible
Minke whale	CGNS	65	0.630	0.00	Negligible
Humpback whale	None	Minimal	Minimal	Minimal	Negligible
Fin whale	None	8	Minimal	Minimal	Negligible
Grey seal	WI	83	0.270	0.00	Negligible
Harbour seal	WI	11	0.220	0.00	Negligible

Sensitivity or value of receptor

13.8.2.40 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.8.2.41 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Very-high-frequency cetaceans

13.8.2.42 Harbour porpoises are highly sensitive to underwater noise, with studies suggesting behavioural disturbance up to 70 km from the pile driving, at which noise generated would be audible over background noise (Bailey *et al.*, 2010). Current UK guidance assumes total displacement within 26 km of pile driving, however monitoring at a wind farm on the east coast of Scotland/*Alba* recorded a 50% probability of harbour porpoise response to pile driving within 7.4 km of the first pile location, lowering to 1.3 km at the last pile location with an overall 18% probability of displacement within 26 km (Graham *et al.*, 2019). In this study, porpoises were present within the wind farm construction site throughout the construction period, however 50% were displaced from the vicinity of pile driving activity (Graham *et al.*, 2019). The use of ADDs and increased vessel activity prior to pile driving led to increased fleeing response levels, highlighting that pre-piling activities can act as an early deterrent and may reduce the number of individuals subjected to underwater noise and disturbance effects.

13.8.2.43 Harbour porpoises are potentially the cetacean species most vulnerable to disturbance effects given their small size, which makes them susceptible to rapid heat loss, and requires that they forage almost continuously to maintain a constant high metabolic rate (Rojano-Doñate *et al.,* 2018). Any disturbance effects may risk overall fitness of individuals if they are displaced from foraging areas and have to find alternative foraging opportunities, increasing their energy expenditure. Although it is considered that even moderate disturbances may have severe consequences for some individuals (Wisniewska *et al.*, 2016), the expert elicitation workshop in 2018 determined that disturbance from exposure to piling noise was unlikely to significantly affect foraging behaviours in harbour porpoise (Booth and Heinis, 2018).

High-frequency cetaceans

13.8.2.44 HF cetaceans scoped into the assessment include white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species. Noise generated during pile driving has the potential to affect HF cetaceans by masking vocalisations and reducing communication opportunities, reducing their ability to detect prey and forage efficiently, and making navigation more difficult. This increases their vulnerability to vessel collision or being predated upon. Behavioural disturbance may reduce vital rates, leading to population-level effects if disturbance is prolonged and individuals cannot compensate for the loss in foraging opportunities and increased energetic costs of disturbance (Booth *et al*, 2019; New *et al.,* 2013).

13.8.2.45 There are limited studies investigating disturbance effects from pile driving of HF cetaceans. Within the HF cetacean group, bottlenose dolphin are the most studied species, given their regular occurrence and coastal distribution (Cheney *et al.,* 2013; Hague *et al.,* 2020).There is conflicting research surrounding the impacts of piling on bottlenose dolphin behaviour. Bottlenose dolphin have been recorded spending a reduced period of time in the vicinity of pile driving during OWF construction works and may exhibit behavioural disturbance within 50 km of pile driving (Bailey *et al.*, 2010; Graham *et al.*, 2017). Other studies have, however, shown that bottlenose dolphins continue to use areas despite piling activities and, on a small temporal scale, there was a consistent increase in dolphin detections at the impact sites during activities that generated impulsive noise (Fernandez-Betelu *et al.,* 2021). The study found that the impulsive noise generated by offshore activities at distances of 40-70 km and at 50-70 km did not cause displacement of dolphins using the southern Moray Firth. Other studies also suggest that displacement of bottlenose dolphins only occurs at shorter distances, where they may move out of the immediate vicinity during pile driving activity (Graham *et al.,* 2017). The expert elicitation workshop in 2018 concluded that while foraging and foraging-related communication might be affected, it was considered unlikely to have a significant impact on an individual's ability to forage or communicate (Booth *et al.*, 2019).

Low-frequency cetaceans

13.8.2.46 The baleen whales (mysticetes) are LF cetaceans and the LF noise produced during pile driving has potential to overlap with the hearing ranges of minke, humpback and fin whales. Pile driving can be detected at up to 70 km from source, and behavioural effects have been observed in minke whales at distances of 40-50 km from such activity (Bailey *et al.,* 2010). Given that little further information is available about the behavioural effects of piling on LF cetaceans, behavioural effects on other cetacean hearing groups are considered as a proxy.

Phocid carnivores in water

13.8.2.47 Underwater noise from pile driving has the potential to cause behavioural disturbance to both grey and harbour seals. Behavioural effects, including displacement from important areas, may result in lost foraging opportunities or affect the frequency of mothers returning to their pups, increasing the risk of separation. Expert elicitation concluded that both harbour and grey seals have reasonable ability to compensate for missed foraging opportunities due to underwater noise disturbance, with grey seals being more resilient to disturbance due to their higher energy stores and adaptable diet (Booth *et al.*, 2019).

13.8.2.48 For a study carried out in the Moray Firth, the zone of impact from piling for pinnipeds was estimated to be within 14 km of the source, which is a smaller distance compared to harbour porpoise, bottlenose dolphin and minke whale (Bailey *et al.*, 2010). Seals may exhibit behavioural changes within this range. However, piling noise may travel much greater distances – up to 80 km – before becoming inaudible above background noise (Bailey *et al.*, 2010).

13.8.2.49 Harbour seals tagged in The Wash also showed displacement from pile driving, with up to an 83% reduction in abundance compared to periods without piling activity (Russel *et al.*, 2016). Abundance was reduced up to 25 km from the piling source, however displacement was temporary, as seals returned to the area within 2 hours post-piling operations. A number of studies have investigated harbour seal auditory systems, with higher levels of TTS resulting in longer recovery times (Hastie *et al.*, 2015).

13.8.2.50 Harbour seals travel varying distances on foraging trips, with some seals foraging >100 km from their nearest haul-out in search of food, while others remain in inshore waters, within a few kilometres. Grey seals also forage in open seas and frequently travel over 100 km between haul-out sites, with foraging trips lasting up to 30 days (SCOS, 2022). Given both grey and harbour seals' large foraging distances and wide variety of prey species (SCOS, 2022), their ability to store adequate fat reserves and general life history traits, it is unlikely that short-term displacement would have an effect on the vital rates or survival of either species (Booth *et al.*, 2019).

Summary

13.8.2.51 To summarise, considering that cetaceans and pinnipeds are highly adapted to a life at sea and that cetaceans especially have developed highly complex vocalisation behaviours, all marine mammals are classed as being sensitive to sound. Additionally, marine mammals are internationally protected, as EPS (all cetaceans) and/or by means of SAC designation to promote their conservation (grey and harbour seals, harbour porpoise and bottlenose dolphin).

13.8.2.52 Despite this, the evidence suggests that many species will tolerate 'disturbing' levels of noise, should there be a strong enough motivation. As such, the sensitivity of all marine mammal receptors is considered to be **Low**. This is based on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.8.2.53 There is potential for disturbance from piling noise to take place during the construction phase of the Offshore Project. Considering the embedded mitigation described in **Table 13-25**, the residual effects of disturbance from piling noise on marine mammal receptors are summarised in **Table 13-71.**

North-east Lewis MPA

13.8.2.54 Noise contours are predicted to extend across the boundary and into the North-east Lewis MPA. However, across the much wider area assessed for disturbance impacts to Risso's dolphins, the significance of effect was found to be negligible. It is therefore considered that piling noise during the Offshore Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

Sea of the Hebrides MPA

13.8.2.55 Given the position of the Sea of the Hebrides MPA some 80 km to the south of the Array Area, there is a distance of approximately 40 km between the MPA boundary and the predicted extent of piling noise. It is therefore considered that piling noise during the Offshore Project's construction phase is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA nor any supporting feature upon which minke whale is dependent, in terms of disturbance, either directly or indirectly.

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Table 13-37 Significance of effect of disturbance from piling noise to Marine Mammals during the construction phase

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Harbour porpoise	Negligible	Low	M019 and M003	Negligible	**Not significant**	Expert elicitation determined that disturbance from exposure to piling noise was unlikely to significantly affect foraging behaviours in harbour porpoise (Booth *et al.*, 2019). iPCoD modelling results concluded that disturbance from piling is estimated to result in a 0.18% change in mean population size, with the population predicted to continue on a stable trajectory.
White-beaked dolphin	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 1.90% of the UK portion of the CGNS MU are predicted to be disturbed from piling, and it is anticipated that white-beaked dolphin populations will remain stable in their future trajectories and any decrease as a result of disturbance will be minimal (Sparling *et al.*, 2017).
Common dolphin	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 0.003% of the UK population size of the CGNS MU would be disturbed by piling activities, and it is anticipated that populations will continue on their trajectories and any decrease in mean population size as a result of disturbance will be minimal.
Bottlenose dolphin	Low (CWSH MU) Negligible (OW MU)	Low	M019 and M003	Negligible	**Not significant**	Expert elicitation concluded that dolphins may be disturbed by piling activities, however effects were unlikely to have a significant impact on individuals' ability to forage or communicate (Booth *et al.*, 2019). Bottlenose dolphin within the CWSH MU are not of a higher magnitude given that effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population. iPCoD modelling results concluded that disturbance from piling is estimated to result in a 2.33% change in mean population size. Modelling results for bottlenose dolphin within the OW MU concluded that disturbance from piling is estimated to result in a 0.08% change in mean population size. Both MU populations are predicted to remain on a stable population trajectory.

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Risso's dolphin	Low	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 9.168% of the UK portion of the CGNS MU are predicted to be disturbed from piling, however it is anticipated that Risso's dolphin populations will continue on their trajectories and any decrease in mean population size as a result of disturbance will be minimal.
Atlantic white-sided dolphin	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 0.789% of the UK portion of the CGNS MU are predicted to be disturbed from piling, however it is anticipated that Atlantic white-sided dolphin populations will continue on their trajectories and any decrease in mean population size as a result of disturbance will be minimal.
Long-finned pilot whale	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 202 long-finned pilot whales are predicted to be disturbed by piling noise. No percentage population is available, however no effects on the population size as a result of disturbance are anticipated.
Killer whale	Negligible	Low	M019 and M003	Negligible	**Not significant**	Given the large ranges of killer whale populations on the west coast of Scotland/*Alba*, it is anticipated that that effects on the population size as a result of disturbance will be minimal.
Beaked whale species	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 17 beaked whale species are predicted to be disturbed by piling noise. No percentage population is available, however it is anticipated that effects on the population size as a result of disturbance will be minimal.
Minke whale	Negligible	Low	M019 and M003	Negligible	**Not significant**	An estimated 0.63% of the UK population of the CGNS MU was estimated to be disturbed from piling, with iPCoD modelling results concluding that disturbance is estimated to result in a 0% change in mean population size. The mean impacted population size for minke whale is therefore estimated to be the same as the un-impacted population.

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Humpback whale	Negligible	Low	M019 and M003	Negligible	**Not significant**	No MU or iPCoD parameters are available for humpback whale, and the lack of information is likely due to their low presence. Therefore, any disturbance effect on humpback whale populations from piling is anticipated to be minimal.
Fin whale	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results predicted that 8 fin whales are predicted to be disturbed by piling noise. No percentage population is available; however, it is anticipated that effects on the population size as a result of disturbance will be minimal.
Grey seal	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results show that 83 grey seals are predicted to be disturbed by piling noise, equating to 0.27% of the population within the WI SMU. iPCoD modelling results concluded that disturbance is estimated to result in a 0% change in mean population size, with the mean impacted population remaining at 100% of the mean un-impacted population.
Harbour seal	Negligible	Low	M019 and M003	Negligible	**Not significant**	Modelling results show that 11 harbour seals are predicted to be disturbed by piling noise, equating to 0.22% of the population within the WI SMU. iPCoD modelling results concluded that disturbance is estimated to result in a 0% change in mean population size, with the mean impacted population remaining at 100% of the mean un-impacted population.

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13.8.3 AUDITORY INJURY FROM OTHER CONSTRUCTION NOISE

13.8.3.1 Auditory injury may occur as a result of underwater noise generated through non-piling activities during the construction phase. Other construction activities which contribute to underwater noise include non-impulsive noise-generating activities, such as cable laying, drilling and grouting, grinding, rock placement, trenching, vessel noise and water jetting. Marine mammals are particularly sensitive to underwater noise because they use sound for communication, foraging, predator detection, and navigation. The maximum design scenario relating to auditory injury from other construction noise during the construction phase is presented in **Table 13-24**.

13.8.3.2 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.3.3 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.3.4 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**), which includes a OEMP (M019) and MMMP (M003), both of which contribute to minimising the effects of underwater noise during the construction phase.

13.8.3.5 **Table 13-38** gives results for all hearing groups for auditory injury (PTS) from other (non-piling) construction activities, based on the uniform density estimates listed in **Table 13-23** and following the methodology outlined in Section 13.5.4.

Table 13-38 Results for non-impulsive PTS of other construction noise for all hearing groups

Construction Activity	PTS (Non-impulsive; SEL_{cum}, dB re 1µPa²s)							
	VHF		HF		LF		PCW	
	Max. range	No. animals	Max. range	No. animals	Max. range	No. animals	Max. range	No. animals
Cable laying	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Drilling (drill and grout)	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Excavation (Backhoe Dredger)	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Grinding	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Rock placement	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1

Construction Activity	PTS (Non-impulsive; SEL_{cum}, dB re 1µPa²s)							
	VHF		HF		LF		PCW	
	Max. range	No. animals	Max. range	No. animals	Max. range	No. animals	Max. range	No. animals
Trenching	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Vessel noise (large)	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Vessel noise (medium)	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1
Water jetting	<100 m	<1	<100 m	<1	<100 m	<1	<100 m	<1

13.8.3.6 The results show that the predicted maximum range of the PTS-onset noise contour for other construction activities is less than 100 m, leading to less than one animal receiving an auditory injury for each of the receptors.

13.8.3.7 In summary, the magnitude of the impact of other construction noise on auditory injury for any species is considered to be **Negligible**. This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population and very short-term effect and no changes to population size or future trajectory.

Sensitivity of receptor

13.8.3.8 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.8.3.9 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Very-high-frequency cetaceans

13.8.3.10 There is little information on whether underwater noise generated by other construction activities may result in auditory injury for VHF cetaceans such as harbour porpoise. The effects of many of the other construction activities on harbour porpoise are limited, with much of the information available being based on disturbance effects rather than auditory injury.

13.8.3.11 Harbour porpoise are well documented in terms of behavioural response to construction vessels, with studies indicating they can be displaced up to 4 km away, with increased levels of vessel activity and broadband noise (Benhemma-Le Gall *et al.*, 2021; 2023). Increased construction activities prior to piling may result in a fleeing response, highlighting that pre-piling activities can act as an early deterrent and may reduce the likelihood of auditory injury (Brant *et al.*, 2018). Animals would need to stay in close proximity to noise sources for prolonged periods of time in order for auditory injury to occur which is unlikely given that animals are known to flee from high levels of underwater noise prior to injury or PTS. Auditory injury is therefore unlikely.

13.8.3.12 Underwater noise generated from activities such as trenching is highly variable and can depend on environmental factors and physical properties of the seabed (Nedwell *et al.*, 2003). Estimated auditory injury ranges for cetaceans from other construction activities were investigated within Nedwell et *al.* (2012) which concluded that the predicted impact ranges for other construction activities (such as cable laying) are much smaller than impact ranges for piling. Assuming a fleeing response from marine mammal receptors, Nedwell *et al.* (2012) estimated impact ranges to be <1 m for all hearing groups when exposed to underwater noise from vessel noise associated with export cable installation, cable laying, trenching and cable protection operations.

High-frequency cetaceans

13.8.3.13 HF cetacean species have a lower upper-frequency hearing limit than VHF cetaceans and are less sensitive to underwater noise in comparison to harbour porpoise. Within the HF cetacean group, bottlenose dolphin are the most studied species given their regular occurrence and coastal distribution (Cheney *et al.*, 2013; Hague *et al.*, 2020). There is limited information available as to how construction activities excluding piling may cause auditory injury to HF cetaceans.

13.8.3.14 Culloch *et al.* (2016) investigated the effect of construction activity on common dolphins in northwest Ireland during construction of a gas pipeline. In this study an increase in vessel numbers had a strong negative corelation on common dolphin occurrence, however this was linked to disturbance rather than auditory injury ranges. Other studies on common dolphin have found little evidence to suggest that auditory injury occurs from other construction activities (Meissner *et al.*, 2015; Silva *et al.*, 2024). Nedwell *et al.* (2012) concluded that assuming a fleeing response to other construction activities (including underwater noise from vessel noise associated with export cable installation, cable laying, trenching and cable protection operations), the auditory injury range for HF cetaceans was <1 m.

Low-frequency cetaceans

13.8.3.15 There is very little information on the effects of construction-related activities on LF cetaceans, particularly for humpback and fin whales and relating to auditory injury. This group of cetaceans is more sensitive to low frequency sounds, and therefore activities which emit lower frequency underwater noise, such as noise from vessel movements, will have a greater impact than other activities.

13.8.3.16 Nedwell *et al.* (2012) concluded that assuming a fleeing response to other construction activities (including underwater noise from vessel noise associated with export cable installation, cable laying, trenching and cable protection operations), the auditory injury range for LF cetaceans was <1 m.

Phocid carnivores in water

13.8.3.17 Pinnipeds in water have the potential to receive auditory injury from other construction activities, particularly in areas where construction spatially overlaps with coastal areas where seals haul-out to moult, breed and rest, and with coastal waters which are productive foraging areas. There is little information on the effects of other construction activities, such as vessel noise, on grey and harbour seals. Research on seal responses to construction noise is primarily related to pile driving and relates to disturbance rather than auditory injury.

13.8.3.18 There is generally limited information available on whether other construction activities cause auditory injury in pinnipeds (in water). Nedwell *et al.* (2012) concluded that marine mammals would exhibit a behavioural avoidance or fleeing response to underwater construction noise (including underwater noise from vessel noise associated with export cable installation, cable laying, trenching and cable protection operations), at relatively low sound exposure levels that were below injury thresholds. A fleeing response is expected when seals are disturbed by underwater noise, and therefore individuals are unlikely to remain stationary for long enough to develop auditory injury or PTS.

Summary

13.8.3.19 To summarise, considering that cetaceans and pinnipeds are highly adapted to a life at sea and that cetaceans especially have developed highly complex vocalisation behaviours, and despite the assumption that marine mammals would flee in response to construction noise, all marine *mammal* receptors are considered to have some vulnerability to auditory injury from other construction noise. Additionally, marine mammals are internationally protected, as EPS (all cetaceans) and/or by means of SAC designation to promote their conservation (grey and harbour seals, harbour porpoise and bottlenose dolphin).

13.8.3.20 As such, the sensitivity of all marine mammal receptors is considered to be **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.8.3.21 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the development of an OEMP (M019), alongside adherence to a MMMP (M003) to reduce the auditory injury from other construction noise. Overall, it is predicted that the magnitude impact of auditory injury from other construction noise on Marine Mammals is **Negligible**, and the sensitivity is **Medium**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.3.22 Given the predicted extent of <100 m for the PTS noise contours for HF cetaceans, the likelihood of auditory injury to Risso's dolphins in the North-east Lewis MPA, over 20 km to the northeast of the Array Area, is negligible. It is therefore considered that other construction noise is not capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of auditory injury, either directly or indirectly.

Sea of the Hebrides MPA

13.8.3.23 Given the predicted extent of <100 m for the PTS noise contours for LF cetaceans, the likelihood of auditory injury to minke whales in the Sea of the Hebrides MPA, over 80 km to the south of the Array Area, is negligible. It is therefore considered that other construction noise is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA in terms of auditory injury, either directly or indirectly.

13.8.4 DISTURBANCE FROM OTHER CONSTRUCTION NOISE

13.8.4.1 During the construction phase, other construction activities associated with the Offshore Project are anticipated to produce underwater noise, which may result in disturbance, avoidance, or other alterations of behaviour in marine mammals. These include cable laying, drilling and grouting, grinding, rock placement, trenching, vessel noise and water jetting. Other construction activities also encompass landfall construction works conducted within the HDD Exit Pit Area.

13.8.4.2 The maximum design scenario relating to disturbance from other construction noise during the construction phase is presented in **Table 13-24**.

13.8.4.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors is given in the following paragraphs.

Magnitude

13.8.4.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.4.5 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**), which includes relevant mitigation measures such as a OEMP (M019) and MMMP (M003), both of which contribute to minimising the effects of underwater noise during the construction phase.

13.8.4.6 Aside from piling, underwater noise may be produced by a range of construction activities, such as cable laying, drilling and grinding. **Appendix 13.3, Volume 2b** gives estimates of unweighted source levels for such activities, which has been reproduced in **Table 13-39**. Special consideration should be given to drilling, as the drill and grout method will be used for pile installation in a large section of the Turbine Area.

Table 13-39 Summary of estimated unweighted source levels for construction activities other than piling

Construction Activity	Estimated source level
Cable laying	171 dB re 1 μPa @ 1 m
Drilling (drill and grout)	169 dB re 1 μPa @ 1 m
Excavation (backhoe dredger)	165 dB re 1 μPa @ 1 m
Grinding	183 dB re 1 μPa @ 1 m
Rock placement	172 dB re 1 μP @ 1 m
Trenching	172 dB re 1 μP @ 1 m
Vessel noise (>100 m in length, 10 knots)	168 dB re 1 μPa @ 1 m
Vessel noise (<100 m in length, 10 knots)	161 dB re 1 μPa @ 1 m
Water jetting	170 dB re 1 μPa @ 1 m

13.8.4.7 No guidance exists for the assessment of disturbance from other construction noise, in terms of thresholds, and there is limited evidence available on disturbance ranges from non-piling construction activities. Disturbance distances documented during drilling vary by species, but suggest ranges of 10-20 km for baleen whales (as summarised in Sinclair *et al.*, 2023).

13.8.4.8 Much of the evidence suggests that disturbance will primarily be from vessels during construction activities. Harbour porpoises have been shown to be displaced up to 4 km away by increased levels of vessel activity and vessel-related broadband noise (Benhemma-Le Gall *et al.*, 2021; 2023). Studies of dredging disturbance of seals suggested that individuals could be disturbed between 400 m to 5 km from site (McQueen *et al.*, 2020), while dredging activity at Aberdeen Harbour was assumed to exclude dolphins within 1 km of the works (Pirotta *et al.*, 2015).

13.8.4.9 It is therefore expected that impacts to seals and most cetaceans will occur within 5 km of the activity, taking place intermittently, over the short-term construction period, while impacts on baleen whales may extend to 10-20 km.

13.8.4.10 In *summary*, the magnitude of the impact of other construction noise on disturbance for any species is considered to be **Negligible**. This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population, and very short-term effect and no changes to population size or future trajectory.

Sensitivity or value of receptor

13.8.4.11 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.8.4.12 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and *international* legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Very-high frequency cetaceans

13.8.4.13 Harbour porpoises may be disturbed and/or displaced from noise-generating construction activities in areas where underwater noise levels are higher than background levels, for example in the presence of construction vessels (Benhemma-Le Gall *et al.*, 2021). Short-term and long-term displacement, in addition to changes in foraging behaviour, have been reported as potential consequences of construction-related activity, however studies reporting these effects generally include effects from pile driving (Benhemma-Le Gall *et al.*, 2021; Pirotta *et al.*, 2014).

13.8.4.14 Culloch *et al.* (2016) investigated the effect of construction activity on harbour porpoise in northwest Ireland during construction of a gas pipeline. This study presented evidence to suggest that fine-scale temporal occurrence of harbour porpoise was influenced by the presence of construction-related activity in the area, with lower occurrence rates recorded on days where construction-related activity was taking place (Culloch *et al.*, 2016). Specific effects from singular activities cannot be identified, given that multiple activity types occurred on the same day.

13.8.4.15 Harbour porpoise are well documented to respond to presence of construction vessels, with studies indicating they can be displaced up to 4 km away by increased levels of vessel activity and vessel-related broadband noise (Benhemma-Le Gall *et al.*, 2021; 2023). A range of effects have been reported from vessel traffic, including vigorous fluking, bottom diving, interrupted foraging and cessation of echolocation (Wisniewska *et al.*, 2017). Another study found a significant relationship between harbour porpoise and vessels present, with 26% of interactions considered to be negative when vessels were 1 km away (Oakley *et al.*, 2017). Graham *et al.* (2019) presented information on harbour porpoise displacement during the construction of a wind farm on the east coast of Scotland/*Alba*, where increased vessel activity prior to pile driving increased response levels. This suggests that pre-piling activities can act as an early deterrent and may reduce the number of individuals subject to underwater noise and disturbance effects (Graham *et al.*, 2019).

High-frequency cetaceans

13.8.4.16 HF cetaceans may be disturbed from noise generated from other construction activities, however there is limited information on how they respond, with most research focused on piling activities, or non-construction vessel disturbance. Increased noise levels can result in the masking of vocalisations, and reduction in communication and prey detection/foraging opportunities making navigation more difficult. This increases their vulnerability to vessel collision or being predated upon (New *et al.*, 2013). Behavioural disturbance may reduce vital rates, leading to population-level effects if disturbance is prolonged and individuals cannot compensate for the loss in foraging opportunities and increased energetic costs of disturbance.

13.8.4.17 Interactions between vessels and dolphins has resulted in various ecological responses, with some showing no behavioural response, and other species being highly displaced. A recent study on the effects of marine traffic in the Aegean Sea on common and bottlenose dolphins highlighted that feeding, socialising, and travelling were more prevalent in vessel presence, whilst energy-intensive behaviours, such as diving, porpoising (leaping out of the water whilst swimming at high speed) and sharking (swimming just below the surface of the water) were the opposite (Roth, 2025). A key finding of this study was that there was no significant difference in the percentage time common or bottlenose dolphin spent resting in the presence or absence of vessels, however the study also noted that increased travelling and stress behaviours can have biologically significant consequences on the physical fitness, energetic budget, health, and reproductive output of common and bottlenose dolphin populations.

13.8.4.18 Within the Moray Firth/*An Cuan Moireach*, vessel movements associated with offshore wind did not have a negative effect on bottlenose dolphins, however vessels may have disrupted foraging behaviour (Lusseau *et al*., 2011). Bottlenose dolphins monitored in Aberdeen/*Obar Dheathain* Harbour had various responses to vessels which were dependent on boat size, activity and speed (Sini *et al*., 2005). This study suggests that dolphins in this area may have become habituated to vessel traffic, and actively approach vessels to initiate bow-riding, surfing, leaping and breaching around the vessel. Some individuals were observed taking longer dives after vessels had passed, followed by splashing, breaching and throwing prey items into the air, where they were believed to have taken advantage of vessels stirring up bottom-dwelling prey (Sini *et al*., 2005). This suggests that dolphins, although potentially temporarily disturbed, are highly adaptable to vessel traffic, and short-term disturbance from vessel noise is unlikely to result in long-term disturbance or have effects on vital rates.

Low-frequency cetaceans

13.8.4.19 Underwater noise generated from other construction activities, particularly noise which is of low frequency such as vessel noise, has the potential to cause disturbance to minke, humpback or fin whales. *There* is limited information published on how humpback and fin whale respond to construction-related-noise, however, given that minke whales are reported to be disturbed from a range of noise-generating activities, it is possible that similar behavioural disturbance may occur for these species. There is specifically a lack of information relating to cetacean behavioural disturbance and disturbance ranges for other construction activities, particularly LF cetaceans.

13.8.4.20 Culloch *et al.* (2016) investigated the effect of construction activity on minke whale presence, and found that construction related activity, on a fine temporal scale, reduced presence on active days. Given that multiple activities occurred at the same time, the specific disturbance-causing activities could not be identified (Culloch *et al*., 2016). A study investigating the presence/absence of minke whales during the construction of an underwater gas pipeline in the northwest of Ireland concluded that minke whale presence was negatively correlated with the total number of boats and minke whales were displaced by high levels of construction-related vessel traffic, most likely due to noise disturbance (Anderwald *et al.,* 2013). It is expected that minke whale displacement during other construction activities is primarily driven by an increase in underwater noise results in short-term displacement.

13.8.4.21 Minke whales have been reported to change diving behaviour in the presence of whale watching vessels, in which vessel noise may play a role (Christiansen *et al.,* 2013). In this study, minke whale swim speed increased in the presence of vessels and respiration rates increased by up to 28%. This is likely to be a stress response, and may result in displacement and behaviour change, resulting in *less* time spent foraging. A reduction in foraging activity could result in changes to vital rates and survival, however it is unlikely that long-term effects, for example on foetal growth, would occur (Christiansen and Lusseau, 2015). Given that whale-watching vessels target whales and remain in the area for prolonged periods of time, minke whales are likely to be less sensitive to construction-related vessel noise.

Phocid carnivores in water

13.8.4.22 Underwater noise from non-piling construction-related activities also has the potential to cause behavioural disturbance to both grey and harbour seals. Changing behaviour and *displacement* from important areas may result in lost foraging opportunities or affect the frequency of mothers returning to their pups, increasing the risk of separation. Expert elicitation concluded that both harbour and grey seals have reasonable ability to compensate for missed foraging opportunities due to underwater noise disturbance, with grey seals being more resilient to disturbance due to their higher energy stores and adaptable diet (Booth *et al.,* 2019).

13.8.4.23 Harbour seals travel varying distances on foraging trips, with some seals foraging >100 km from their nearest haul-out in search of food. Grey seals also forage in open seas and frequently travel over 100 km between haul-out sites, with foraging trips lasting up to 30 days (SCOS, 2022). Given both *grey* and harbour seals' large foraging distances and wide variety of prey species (SCOS, 2022), their ability to store adequate fat reserves and general life history traits, it is unlikely that short-term displacement would have an effect on the vital rates or survival of either species (Booth *et al.,* 2019).

Summary

13.8.4.24 To summarise, considering that cetaceans and pinnipeds are highly adapted to a life at sea and that *cetaceans* especially have developed highly complex vocalisation behaviours, all marine mammals are classed as being highly sensitive to sound. Additionally, marine mammals are internationally protected, as an EPS (all cetaceans) and/or by means of SAC designation, to promote their conservation (grey and harbour seals, harbour porpoise and bottlenose dolphin).

13.8.4.25 Despite this, the evidence suggests that many species will tolerate 'disturbing' levels of noise, should there be a strong enough motivation. As such, the sensitivity of all marine mammal receptors is considered to be **Low**. This is based on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.8.4.26 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the development of an OEMP (M019), alongside adherence to a MMMP (M003) to reduce the disturbance from other construction noise. Overall, it is predicted that the magnitude impact of disturbance from other construction noise on Marine Mammals is **Negligible**, and the sensitivity is **Low**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.4.27 Disturbance from other construction noise on Risso's dolphins was found to have a negligible significance of effect. It is therefore considered that other construction noise is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

Sea of the Hebrides MPA

13.8.4.28 Given the position of the Sea of the Hebrides MPA some 80 km to the south of the Array Area, it is *considered* that other construction noise is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA nor any supporting feature upon which minke whale is dependent, in terms of disturbance, either directly or indirectly.

13.8.5 VESSEL COLLISION

13.8.5.1 Construction will result in a number of Offshore Project vessels being utilised in the Array Area, cable route corridor and waters used to access these areas, above baseline traffic levels. Marine mammals are at risk of collision with vessels, which can result in injuries or mortality, with some species being more vulnerable than others. Vessels associated with the construction phase will follow prescribed routes and set transit speeds to reduce the probability of collision. Construction works will follow relevant guidance to minimise the risks of injury.

13.8.5.2 The maximum design scenario relating to vessel collision during the construction phase is presented in **Table 13-24**.

13.8.5.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.5.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.5.5 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**) which describes the current guidance, such as the Scottish Marine Wildlife Watching Code, with which Project vessels should comply to reduce collision risk.

13.8.5.6 As described in **Chapter 16, Volume 2a**, the west coast of Scotland/*Alba* is an important area for shipping and navigation, with a range of vessels utilising the region throughout the year. During site-specific DAS for the Offshore Project during winter 2024, there was an average of 5-6 unique vessels per day recorded within the Shipping and Navigation Study Area. During summer 2024 surveys, there was an increase in observed vessel traffic, with an average of between 7 and 8 unique vessels per day within the Shipping and Navigation Study Area. The main types of vessels recorded included fish farm support vessels, fishing vessels, tankers and cargo vessels. No regular roll-on/roll-off cargo (RoRo) or roll-on/roll-off passenger (RoPax) vessel routeing was identified during the summer or winter periods within the Shipping and Navigation Study Area.

13.8.5.7 The addition of construction vessels for the Offshore Project will increase vessel traffic in the region, resulting in potentially higher rates of vessel and marine mammal interactions. However, all vessels will comply with embedded mitigation measures including a OEMP and VMP, which are in place to mitigate against harmful effects to marine mammals, including collision with construction vessels.

13.8.5.8 Project vessels utilised during construction may be deployed simultaneously, and include wind turbine installation vessels (WTIV), construction support vessels, crew transfer vessels, barges, tugs and multifunctional all-purpose vessels and other transport vessels. The maximum vessel assessment assumptions and parameters for WTG installation are outlined in **Table 13-24**.

13.8.5.9 There is currently a lack of up-to-date information on the global frequency of vessel collisions for cetaceans, with information particularly sparse for small cetaceans. In the UK there is little evidence to suggest that vessel collision, particularly with offshore construction vessels, is a significant cause of injury or mortality. This may be due to there being few collision cases, however vessel strikes, predominantly with larger vessels, may go unreported as collisions are not noticed, and large whales may sink after being hit (Vighi, 2025). The last 10 years of SMASS annual reports, which investigate the cause of death for stranded marine animals in Scotland/*Alba*, report that 2 common dolphins and 19 harbour porpoises have died over the period due to physical trauma from boat/ship strike (Brownlow *et al.*, 2024; SMASS, 2023; 2022; Davidson and ten Doeschate, 2021; Davidson *et al.,* 2020; Brownlow *et al.,*2019; 2018; 2017; 2016; 2015). No other stranded species had vessel strike as a cause of death. The higher number of harbour porpoises in the SMASS data could be explained by their larger population size.

13.8.5.10 Given marine mammals' ability to detect vessel presence and move away from vessels, in addition to embedded mitigation measures put in place, the magnitude of risk of injury from collision with construction vessels on marine mammals during the construction phase is assessed as **Low**. This is based on the guidelines for magnitude which state a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity or value of receptor

13.8.5.11 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High Value receptors

13.8.5.12 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.8.5.13 During the construction phase of the Offshore Project, a potential effect of increased vessel activity is vessel collision with marine mammals (Anderwald *et al.,* 2013). Injuries can include sharp and blunt *force* trauma and damage from boat propellors, with some injuries causing permanent injury or mortality (Schoeman *et al.*, 2020). Whales and dolphins have both been documented as surviving injuries relating to vessel collisions, suggesting that not all vessel collisions are fatal (Bloom, 1994). Surviving animals can, however, suffer long-term health consequences, such as discomfort, pain, reduced mobility and an overall reduction in welfare (de Vere *et al.*, 2018; Schoeman *et al.*, 2020).

13.8.5.14 Marine mammals are known to be susceptible to vessel strike with varying levels of risk, depending on species and type and activity of vessels (Dolman *et al.,* 2018). Assessment of collision risk is, *therefore*, species-dependent and requires information on animal and vessel distribution and vessel activity (Crum *et al.*, 2019; Schoeman *et al.*, 2020). Where information is available, impacts are considered below on a species-to-species basis.

Harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale, grey seal and harbour seal

13.8.5.15 Cetaceans including harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, and grey and harbour seals are all highly mobile and have *shown* avoidance of vessels, highlighting their ability to detect and move away from oncoming vessel traffic (Culloch *et al.,* 2016; Erbe *et al.*, 2019; Onoufriou *et al.,* 2016). These species are likely to be able to detect nearby vessels and avoid collision by moving out of the Zone of Influence, although this is dependent on vessel type and its speed and movement pattern (Anderwald *et al.,* 2013). Some species of dolphin are regularly reported as having positive interactions with small and fast-moving vessels, showing bow-riding behaviours (Reid *et al.*, 2003). This proximity may result in increased vessel strike. However, Project vessel movements will comply with legislative requirements and best practice standards and guidance (see M015 and M029 within **Table 13-25)**, therefore presenting more predictably than non-Project vessels. There are limited studies on the effects of construction vessel strike on other species including pilot whales and killer whales.

13.8.5.16 To conclude, there is a risk of injury from collision with construction vessels for smaller cetaceans and pinniped receptors, but any effects are not likely to be long-term or felt at the population level. If collision with a construction vessel were to occur, the effect on receptors may result in permanent injury or, in extreme cases, mortality, however individuals may be able to recover and maintain body condition despite injuries. Given their ability to move away from oncoming construction vessels, and the potential to recover from vessel interactions, the risk and thus sensitivity of these species is **Low**. This is based on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Minke whale, humpback whale, fin whale and beaked whale species

13.8.5.17 Large and deep-diving cetacean species are more susceptible than smaller cetaceans to vessel collision, due to their larger size, reduced mobility and prolonged time spent at the surface between dives (Laist *et al.*, 2001). Humpback whales, fin whales and minke whales are among the most *reported* species to be impacted by vessel strikes due to their size and surfacing behaviours, however smaller species such as beaked whale species also spend prolonged periods at the surface, leaving them susceptible to vessel strikes (Dolman *et al.,* 2018). Whales are more susceptible to vessel strike in areas with very high intensities of marine traffic; there are a number of small harbours in the region, with the closest being 4 nm away from the Array Area, with much of the vessel traffic being made up of small vessels such as fishing vessels and leisure craft. Further detail on vessel traffic is detailed within **Chapter 16, Volume 2a**.

13.8.5.18 To conclude, there is a risk of injury from collision with construction vessels for minke whale, humpback whale *and* fin whale, but any effects are not likely to be long-term or felt at the population level. However, if collision with a construction vessel were to occur, the effect on receptors may result in permanent injury or mortality and therefore the sensitivity of the above species to risk of injury from collision with construction vessels is classed as **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual’s survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.8.5.19 There is potential for vessel collision to take place during the construction phase of the Offshore Project. Considering the embedded mitigation described in **Table 13-25**, the residual effects of vessel collision on marine mammal receptors are summarised in **Table 13-40**.

North-east Lewis MPA

13.8.5.20 Given that the assessment of Risso's dolphin within the Study Area showed a negligible risk of injury from vessel collision, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be **negligible** and **not significant**. It is therefore *considered* that vessel collision during the Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.8.5.21 Given that the assessment of minke whale within the Study Area showed a minor risk of injury from vessel *collision*, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be **minor** and **not significant**. It is therefore considered that vessel collision during the Project's construction phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

Table 13-40 Significance of effect of vessel collision to Marine Mammals during the construction phase

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Harbour porpoise	Low	Low	M029 and M015	Negligible	**Not significant**	Harbour porpoise are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Harbour porpoise are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
White-beaked dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	White-beaked dolphin are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. White-beaked dolphin are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Common dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Common dolphin are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. White-beaked dolphin are therefore unlikely to be struck by an Offshore Project vessel, and have the

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Bottlenose dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Bottlenose dolphin are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Bottlenose dolphin are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Risso’s dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Risso’s dolphin are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Risso’s dolphin are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Atlantic white-sided dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Atlantic white-sided dolphin are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Atlantic white-sided dolphin are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						collision. Effects are unlikely to be long-term or felt at the population level.
Long-finned pilot whale	Low	Low	M029 and M015	Negligible	**Not significant**	Long-finned pilot whale are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Long-finned pilot whale are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Killer whale	Low	Low	M029 and M015	Negligible	**Not significant**	Killer whale are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Killer whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Beaked whale species	Low	Medium	M029 and M015	Minor	**Not significant**	Beaked whale species are more susceptible to vessel collision as they spend prolonged periods at the surface, however they do have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Beaked whale

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						species are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller cetaceans and seal receptors. Effects on beaked whale species are unlikely to be long-term or felt at the population level.
Minke whale	Low	Medium	M029 and M015	Minor	**Not significant**	Minke whale are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Minke whales do have the ability to detect and move away from oncoming vessel traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Minke whales are therefore unlikely to be struck by a Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on minke whales are unlikely to be long-term or felt at the population level.
Humpback whale	Low	Medium	M029 and M015	Minor	**Not significant**	Humpback whale are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Humpback whales do have the ability to detect and move away from oncoming vessel traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Humpback whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on humpback whales are unlikely to be long-term or felt at the population level.
Fin whale	Low	Medium	M029 and M015	Minor	**Not significant**	Fin whale are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Fin whales do have the ability to detect and move away from oncoming vessel traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Fin whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on fin whales are unlikely to be long-term or felt at the population level.
Grey seal	Low	Low	M029 and M015	Negligible	**Not significant**	Grey seal are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Grey seals are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Harbour seal	Low	Low	M029 and M015	Negligible	**Not significant**	Harbour seal are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						and will therefore be more predictable in their movements than non-Offshore Project vessels. Harbour seals are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.

13.8.6 DISTURBANCE OR TEMPORARY HABITAT LOSS FROM PRESENCE OF VESSELS

13.8.6.1 During the construction phase, a number of Offshore Project vessels will increase the vessel traffic above baseline levels. This increase in vessel presence may result in temporary habitat loss, disturbance or short-term displacement of marine mammals (Anderwald *et al.*, 2013; Dolman and Simmonds, 2010, Culloch *et al.,* 2016). The extent of disturbance and/or habitat loss is dependent on the extent and duration of increased vessel presence. There are few evidence-based sources which explicitly address impacts to marine mammals from physical vessel presence, as an increase in vessel presence is accompanied by increased levels of vessel noise, which may also have a role in displacement and/or habitat loss. Responses to vessel noise are captured within the impact pathway, disturbance from other construction noise (Section 13.8.4).

13.8.6.2 As described in **Chapter 16, Volume 2a** and Section 13.6.1, there is regular vessel activity off the west coast of Scotland/*Alba* with a number of different vessel types utilising waters within the Shipping and Navigation Study Area. The addition of construction vessels for the Offshore Project will increase vessel traffic in the region, resulting in a higher level of vessel presence and underwater ambient noise, which can influence marine mammal presence (Anderwald *et al.*, 2013). To reduce the effects of increased construction-related traffic, all vessels will comply with embedded mitigation measures including a OEMP and VMP (see **Table 13-25; Outline OEMP, Volume 3** and **outline NSVMP, Volume 3**) which are in place to mitigate against harmful effects to marine mammals.

13.8.6.3 The maximum design scenario relating to disturbance or temporary habitat loss from presence of vessels during the construction phase is presented in **Table 13-24**.

13.8.6.4 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.6.5 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.6.6 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**), which describes the current guidance such as the Scottish Marine Wildlife Watching Code, with which Project vessels should comply to reduce collision risk.

13.8.6.7 As described in **Chapter 16, Volume 2a**, the west coast of Scotland/*Alba* is an important area for shipping and navigation, with a range of vessels utilising the region throughout the year. During site-specific DAS for the Offshore Project during winter 2024, there was an average of 5-6 unique vessels per day recorded within the Shipping and Navigation Study Area. During summer 2024 surveys, there was an increase in observed vessel traffic, with an average of between 7 and 8 unique vessels per day within the Shipping and Navigation Study Area. The main types of vessels recorded included fish farm support vessels, fishing vessels, tankers and cargo vessels. No regular roll-on/roll-off cargo (RoRo) or roll-on/roll-off passenger (RoPax) vessel routeing was identified during the summer or winter periods within the Shipping and Navigation Study Area.

13.8.6.8 The addition of construction vessels for the Offshore Project will increase vessel traffic in the region. Project vessels utilised during construction may be deployed simultaneously, and include WTIV, construction support vessels, crew transfer vessels, barges, tugs and multifunctional all-purpose vessels and other transport vessels. The maximum vessel assessment assumptions and parameters for WTG installation are outlined in **Table 13-24**.

13.8.6.9 The area already is already important for shipping and navigation, and the increased physical presence of construction vessels would be temporary. Furthermore, marine mammals are a highly mobile species group and increased vessel presence will present a localised effect. With the embedded mitigation measures put in place, the magnitude of risk of disturbance or temporary habitat loss from vessel presence on marine mammals during the construction phase is considered to be **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.8.6.10 Marine mammals are sensitive to the presence of vessels, with some species known to be more *susceptible* to disturbance from construction vessels. Assessment of disturbance or temporary habitat loss due to construction vessel presence is species-dependent; where information is available, impacts are considered below on a species-to-species basis.

13.8.6.11 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.8.6.12 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and *international* legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Harbour porpoise

13.8.6.13 Harbour porpoise have shown displacement behaviour to a distance of up to 4 km from construction vessels, with porpoise occurrence gradually decreasing several hours prior to piling due to increased levels of vessel activity and broadband noise (Benhemma-Le Gall *et al.*, 2021; 2023). *Displacement* and declines in detection rates have also been observed in other studies, such as described in Brant *et al.* (2018). This paper concludes that within the vicinity (up to 2 km) of the construction site, porpoise detections declined several hours before piling commenced and were reduced for up to 2 days after piling was completed (Brandt *et al.*, 2018). This was considered to be in part due to increased construction vessel traffic, in addition to other noise-generating activities (Brandt *et al.,* 2018).

13.8.6.14 Many investigations into harbour porpoise reactions to vessels are focused on general boat traffic rather than offshore construction vessels. Oakley *et al.* (2017) highlighted that land-based surveys carried out in South Wales observed a significant negative correlation between numbers of vessels and harbour porpoise sightings and noted that porpoise behaviour changed in the presence of vessels, *including* those which were travelling at a steady speed (Oakley *et al.,* 2017). Investigation into harbour porpoise avoidance of vessels in the North Sea has also shown short-term effects to a distance over 9 km, with spatial avoidance particularly noticeable in areas of heavy or frequent vessel traffic (Pigeault *et al.*, 2024).

13.8.6.15 To conclude, there is evidence to suggest that an increase in construction vessel traffic may result in disturbance or temporary habitat loss and can lead to decreased harbour porpoise presence. Observed decreases in harbour porpoise presence have however occurred over short time scales, and it is *unlikely* that displacement effects would be seen in the long-term nor have population wide effects. The sensitivity of harbour porpoise to construction vessel disturbance is classed as **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).

White-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species

13.8.6.16 The majority of studies investigating vessel disturbance on delphinids are focused on bottlenose dolphins, particularly the population present along the east coast of Scotland/*Alba* (Cheney *et al.,* 2013). Bottlenose dolphins have been recorded showing negative reactions to vessel traffic, where disturbances may result in energetic consequences relating to increased foraging time, or effects on vital rates and long-term population dynamics (New *et al.*, 2013; Diamant *et al.*, 2024). Boat presence, independently of noise created by vessels, has been shown to result in a short-term 49% reduction in foraging, with foraging resuming after vessels had passed (Pirotta *et al.*, 2015).

13.8.6.17 Despite some studies indicating negative reactions and behavioural change of bottlenose dolphins in the presence of vessels, New *et al.* (2013) highlighted that behavioural change should not be automatically assumed to be biologically significant (i.e. no effect on vital rates or overall health) and bottlenose dolphins may be able to compensate for behavioural change.

13.8.6.18 There are limited studies available which investigate the effects of construction-related vessel traffic on white-beaked dolphin, common dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species. Culloch *et al.* (2016) investigated the effects of *construction*-related activities and vessel traffic on marine mammals including common dolphin, which concluded that an increase in vessel numbers (independent of construction activity) reduced common dolphin presence in the area. However, the seasonality of patterns in common dolphin occurrence might partly or wholly explain this effect (Culloch *et al.,* 2013).

13.8.6.19 Effects on other species, including bottlenose and Risso's dolphins, have been reported for vessel presence, specifically cetacean-watching vessels, however information on responses to vessel presence is still limited (Bellomo *et al.*, 2021; Senigaglia *et al.*, 2016). Cetacean-watching vessels purposefully *seek* out cetaceans and remain in the area for long periods over consecutive days, whereas construction vessels will operate in accordance with vessel guidance as set out in the OEMP (see **Table 13-25; Outline OEMP, Volume 3**). Therefore, any interactions will be short-lived.

13.8.6.20 To conclude, there is evidence to suggest that an increase in construction vessel traffic may result in disturbance or temporary habitat loss and can lead to decreased dolphin presence. Observed decreases in dolphin presence have however occurred over short time scales, and it is unlikely that displacement effects would be seen in the long-term nor lead to population-level effects. The sensitivity of bottlenose dolphin to construction vessel disturbance is classed as **Low**. This is *based* on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

13.8.6.21 In the absence of evidence on the sensitivity of other delphinids to construction vessel disturbance, it is assumed that behavioural responses may be similar to that of bottlenose dolphin. The sensitivity of white-beaked dolphin, common dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species is therefore classed as **low**.

Minke whale, humpback whale and fin whale

13.8.6.22 There are limited studies available which investigate the effects of construction-related vessel traffic on minke whales, humpback whales and fin whales. Culloch *et al.* (2016) investigated the effect of construction-related activities and vessel traffic on marine mammals, including minke whales, which *provided* evidence that fine-scale temporal occurrences of minke whales were influenced by construction-related activity, including vessel presence (Culloch *et al.,* 2016). The effect of specific activities could not be determined due to multiple activities coinciding on the same day. Previous studies have evidenced that vessels have negative effects on minke whale occurrence, however this cannot be fully attributed to vessel presence, rather construction-related activity in general (Anderwald *et al.*, 2013).

13.8.6.23 Minke whales have shown displacement behaviours and increased energy expenditure during vessel interactions specifically relating to whale-watching boats (Christiansen *et al.*, 2014). In this study, *estimated* energy expenditure increased during boat interactions by approximately 28%, and whales were recorded swimming at optimal speeds to outpace vessels during interactions. Studies have also been published on the effects of whale-watching vessel presence on humpback whales, with a number of Australian studies highlighting that interactions could be both positive and negative (Stamation *et al.*, 2009). Some individuals approached vessels and initiated interactions, however some showed obvious avoidance behaviours, and pods with calves were particularly sensitive. Diving and surfacing behaviours also changed in the presence of vessels. Fin whale responses to whale-watching vessels have also been reported in the southeastern Pacific, where, in the presence of vessels, fin whale movement patterns were altered, with whales swimming faster, changing direction and displaying more erratic and sinuous movements (Santos-Carvallo *et al.*, 2021). Effects observed in the presence of cetacean-watching vessels may differ to construction-related vessel traffic, as watching vessels purposefully seek out cetaceans and remain in the area for long periods over consecutive days. Construction vessels will operate in accordance with vessel guidance as set out in the OEMP (see **Table 13-25; Outline OEMP, Volume 3**), and if there are any interactions, they will be short-lived.

13.8.6.24 To conclude, there is evidence to suggest that an increase in construction vessel traffic may result in disturbance or temporary habitat loss and can lead to decreased minke whale presence. Observed decreases in presence have however occurred over short time scales, and it is unlikely that displacement effects would be seen in the long-term nor lead to population-level effects. The sensitivity of minke *whales* to construction vessel disturbance is therefore classed as **Low**. This is based on the guidance for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

13.8.6.25 In the absence of species-specific data, evidence for minke whale sensitivity can be considered as *indicative* for other baleen whale species. This information is therefore used as a proxy and the sensitivity of humpback and fin whales to construction vessel disturbance is also classed as **Low**.

Grey seal and harbour seal

13.8.6.26 Vessel traffic is known to disturb seals from haul-out sites, however there is little evidence to suggest that the at-sea behaviour of grey and harbour seals is influenced by construction vessel presence alone (Jansen *et al.,* 2015). Grey and harbour seals are less likely to use an area during times of high vessel traffic, with grey seal presence having been negatively correlated with areas of high vessel presence (*Anderwald et al.*, 2013). Changes in habitat use, however, is likely due to noise disturbance rather than the physical presence of vessels (Anderwald *et al.*, 2013). Grey seals may be affected during the construction phase of offshore wind developments, however there is little evidence to suggest effects are singularly due to disturbance from vessel presence and not from other sources (Dietz *et al.*, 2000). Hauled-out harbour seals which are disturbed over short periods are likely to return to the same haul-out sites, with 52% of seals having returned to the same site within 30 minutes in a study by Paterson *et al.* (2019). Haul-out sites for grey and harbour seals are designated within the marine mammal study area. Harbour seal foraging movements are generally restricted to within 50 km of haul-out sites; there are 5 haul-out sites located within 50 km of the Offshore Project (See **Table 13-20**). Expert elicitation concluded that both harbour and grey seals have reasonable ability to compensate for missed foraging opportunities due the effects of disturbance, with grey seals being more resilient to disturbance due to their higher energy stores and adaptable diet (Booth *et al.*, 2019).

13.8.6.27 To conclude, there is evidence to suggest that an increase in vessel traffic, including construction vessels, may result in disturbance or temporary habitat loss for grey and harbour seals. However, the literature suggests that seals recover quickly from being disturbed and return to the same sites at which they were disturbed (Paterson *et al.,* 2019). Given that construction vessels will only be present during the construction phase of the Offshore Project, it is unlikely that displacement effects would be seen in the long-term nor lead to population-level effects on grey or harbour seals. The sensitivity of grey and harbour seals to construction vessel disturbance is therefore classed as **Low**. This is based on the guidance for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.8.6.28 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include details on mitigation measures M029 and M015, which aim to reduce the potential for disturbance or temporary habitat loss from presence of vessels.

13.8.6.29 Overall, it is predicted that the sensitivity of all marine mammal receptors is **Medium**, and the *magnitude* is **Low**. The significance of the effect is therefore **Minor** and is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.6.30 Given that the assessment of Risso's dolphins within the Study Area showed a minor risk of disturbance or temporary habitat loss from vessel presence, the risk within the North-east Lewis MPA is *considered* to be no greater than this and is therefore also predicted to be **minor** and **not significant**. It is therefore considered that disturbance or temporary habitat loss from vessel presence during the Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.8.6.31 Given that the assessment of minke whales within the Study Area showed a minor risk of disturbance or *temporary* habitat loss from vessel presence, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be **minor** and **not significant**. It is therefore considered that disturbance or temporary habitat loss from vessel presence during the Project's construction phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

13.8.7 ACCIDENTAL RELEASE OF POLLUTANTS

13.8.7.1 Accidental pollutant spills from construction activities may negatively impact marine mammal populations through prolonged exposure to chemical pollutants, ingestion of contaminated prey and habitat degradation. Pollutants may enter the marine environment as the result of a single accidental spill or leak of substances such as hydraulic oils or lubricants, or long-term leaching of chemical pollutants such as coatings of paint on ship hulls, which break down and are released into the marine environment (Hengstmann *et al.,* 2025; Lazuga, 2024). Embedded mitigation, such as the OEMP (M019), which complies with requirements and best practices in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL) and SOPEPs, will reduce the likelihood and minimise the impact of any accidental release of pollutants from vessels and equipment.

13.8.7.2 The maximum design scenario relating to accidental release of pollutants during the construction phase is presented in **Table 13-24**.

13.8.7.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.7.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.7.5 During the construction phase of the Offshore Project, accidental release of pollutants is a potential risk for marine mammal receptors. Any effects to marine mammals should be minimal due to effective mitigation measures in place to prevent and control any accidental release of pollutants (see M031 in **Table 13-25**). Additionally, through regular maintenance and checks, any spills are unlikely to occur; the most likely pollution incident would be slow leaks of fluids, which, if managed accordingly, would be remedied quickly and only small amounts of fluid would escape into the marine environment, which would quickly disperse. The magnitude of change for release of accidental release of pollutants is therefore **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.8.7.6 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High Value receptors

13.8.7.7 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.8.7.8 Marine mammals are highly mobile and have the ability to move away from any accidental pollutant release such as oil spills. Despite this, receptors are of high value and do have the potential to be affected by pollutants released during the construction phase of the Offshore Project (Helm *et al.*, 2015; Ramirez-Leon *et al.*, 2023). There is little information on the effects of pollutants released during the construction of OWFs on marine mammals, with the majority of studies investigating the effects of large oil spills on marine wildlife.

13.8.7.9 The greatest risk of exposure to oil spills are at the surface, through contact, inhalation and/or ingestion (Helm *et al.*, 2015; Ramirez-Leon *et al.*, 2023). All marine mammals come to the surface to breathe, and species which spend more time at the surface are more likely to be affected by oil and other pollutants. The long-term consequences are relatively unknown, with vulnerability to spills dependent on the extent and degree of exposure in addition to habitat preference, with species which frequent and inhabit coastal and near-shore waters being more vulnerable (Helm *et al.*, 2015). Animals that show high site fidelity to an area that has been polluted could experience acute or chronic exposure through their respiratory system or ingestion of contaminated prey and be subject to impacts associated with a clean-up effort, such as increased vessel traffic (Helm *et al.*, 2015). Large oil spills have the potential to cause marine mammal mortality, failed reproduction, and damage and disease to internal organs, with severe impacts previously recorded in a coastal bottlenose dolphin population, and population declines observed in some large whale species (Ramirez-Leon *et al.*, 2023).

13.8.7.10 To conclude, there is evidence to suggest that an accidental release of pollutants during the construction phase of the Offshore Project may affect marine mammals, and could potentially have long-term or life-threatening effects. However, given that marine mammals are highly mobile and wide ranging, any contact with pollutants is likely to be short lived. The sensitivity of all marine mammal *receptors* scoped into this assessment is therefore classed as **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.8.7.11 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the *development* of an OEMP (M019), adherence to industry best practice with regard to accidental release of contaminants (M004), best practice techniques for seabed excavations (M005), and production of a MPCP (M031) to reduce the accidental release of pollutants. Overall, it is predicted that the magnitude impact of accidental release of pollutants on Marine Mammals is **Low**, and the sensitivity is **Medium**. The effect is of **Minor**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.7.12 Given that the assessment of Risso's dolphins within the Study Area showed a minor effect from accidental release of pollutants, the risk within the North-east Lewis MPA is considered to be no greater than this *and* is therefore also predicted to be **minor** and **not significant**. It is therefore considered that accidental release of pollutants during the Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.8.7.13 Given that the assessment of minke whales within the Study Area showed a minor effect of accidental release of pollutants, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be minor and not significant. It is therefore considered that accidental release of pollutants during the Project's construction phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

13.8.8 INCREASES IN SUSPENDED SEDIMENT CONCENTRATION AND REDUCTION IN WATER QUALITY

13.8.8.1 During the construction phase, increases in suspended sediment and reductions in water quality caused by Offshore Project activities may negatively affect marine mammal populations both directly and indirectly. Reductions in water quality, increases in suspended sediments in the water column and release of contaminated sediments may occur as a result of works located within the HDD Exit Pit Area, ground preparation, scour protection and cable installation activities, such as jet trenching, OSP installation and drilling of pin piles for WTG foundations. Implications to marine mammals include reductions in foraging success due to visual impairment or negative impacts on the health of prey species.

13.8.8.2 The maximum design parameters relating to increases in suspended sediment concentrations and reduction in water quality is included within **Table 13-24**.

13.8.8.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.8.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.8.5 During the construction phase of the Offshore Project, sediment will be disturbed and result in suspended sediment in the water column. The main causes and effects relating to increases in suspended sediment concentration and a reduction in water quality are detailed in **Chapter 10, Volume 2a**. Secondary effects through impacts to prey species are detailed within **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.

13.8.8.6 The magnitude of direct impacts on marine mammals is dependent on the timing and scale of direct seabed habitat disturbance associated with construction. The assessment in **Chapter 10, Volume 2a** concluded that the significance of effect of changes in suspended sediment concentration and changes in contaminant concentrations was **Minor** for inshore marine waters and **negligible** for offshore marine waters. As a result, the significance of all impacts was assessed as not significant in EIA terms.

13.8.8.7 The magnitude of indirect impacts on marine mammals is dependent on the effects on high value habitats, low value habitats, shellfish and fish species groups. The assessment in **Chapter 11, Volume 2a** concluded that the significance of effect of changes in suspended sediment concentration and changes in contaminant concentrations was **Minor** or **Negligible** for high value habitats and **Negligible** for low value habitats and shellfish. As a result, the significance of all impacts was assessed as not significant in EIA terms. The assessment in **Chapter 12, Volume 2a** concluded that the significance of effect of changes in suspended sediment concentration and changes in contaminant concentrations was **Minor** or **Negligible** (dependent upon species or species group), which are not significant in EIA terms.

13.8.8.8 The magnitude of increases in suspended sediment concentration and reduction in water quality on marine mammals is therefore assessed as **Negligible.** In addition to the above summaries, this magnitude conclusion is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population, and very short-term effect and no changes to population size or future trajectory.

Sensitivity of receptor

13.8.8.9 Marine mammals are highly tolerant of marine environments with a high suspended sediment load and regularly forage in areas of poor visibility. Marine mammals may use vision to some extent when foraging, however using multiple mechanisms to detect and catch prey allows marine mammals to forage successfully even in poor visibility or darkness (Heithaus and Dill, 2009; Torres, 2017).

13.8.8.10 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.8.8.11 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Cetaceans

13.8.8.12 To forage effectively, cetaceans use multiple methods in which to catch prey species including vision, sound production and reception, chemoreception, magnetoreception and other stimuli from the marine environment (Torres, 2017). Hearing is the primary sense for cetacean species, with toothed whales locating prey using echolocation (Johnson *et al.*, 2007; Verfuss *et al.*, 2009). Dolphins are believed to have equivalent visual and acoustic acuity, which is useful for detecting in-air surface cues and in-water prey capture. Despite sight being useful when foraging, cetaceans can forage efficiently without using sight; trained harbour porpoises have been observed searching for and capturing live fish, with animals repeatedly succeeding in blindfolded prey-capture tasks (Verfuss *et al.*, 2009). Baleen whale foraging methods involve bulk-filter-feeding, where large quantities of prey are consumed at once. Baleen whales, similarly, to toothed whales, use sight as an aid while foraging, however, they can detect and successfully capture prey in low light or conditions of poor visibility.

Pinnipeds

13.8.8.13 Vision is an important sense for pinnipeds when foraging, and even deep-diving species are capable of using vision to detect prey in darkness (Heithaus and Dill, 2009). Pinnipeds have sensitive whiskers called vibrissae, which can detect water movement and disturbances caused by moving prey species (Deecke *et al.*, 2011; Milne *et al.*, 2021). Despite using vision to aid foraging efficiency, seals have sensory abilities to forage in low light or conditions of poor visibility, and a short-term increase in suspended sediment and turbidity is unlikely to significantly impact foraging success.

13.8.8.14 To conclude, short-term changes in suspended sediment concentration or reductions in water quality as a result of Offshore Project *construction* activities are therefore unlikely to affect marine mammals. The sensitivity of marine mammal receptors scoped into this assessment is therefore classed as **Negligible**. This is based on the guidelines for sensitivity which state that a receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Significance of effect

13.8.8.15 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the adherence to industry best practice with regard to accidental release of contaminants through sediment disturbance (M004), best practice techniques for seabed excavations (M005) and production of a MPCP (M031) to reduce the impact of increases in suspended sediment concentration and reduction in water quality. Overall, it is predicted that the magnitude impact of increases in suspended sediment concentration and reduction in water quality on Marine Mammals is **negligible**, and the sensitivity is **negligible**. The effect is **negligible**, which is **not significant** in EIA terms.

North-east Lewis MPA

13.8.8.16 The modelled extent of dispersed sediments from cable installation options during the construction phase of the Offshore Project was 6 km from the Array Area and OCAS (**Chapter 10, Volume 2a**). Given that the North-east Lewis MPA is over 20 km to the northeast of the Array Area, it is considered that increases in suspended sediment concentration and reduction in water quality during the Project's construction phase are not capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, either directly or indirectly.

Sea of the Hebrides MPA

13.8.8.17 The modelled extent of dispersed sediments from cable installation options during the construction phase of the Offshore Project was 6 km from the Array Area and OCAS (**Chapter 10, Volume 2a**). Given that the Sea of the Hebrides MPA is over 80 km to the south of the Array Area, it is considered that *increases* in suspended sediment concentration and reduction in water quality during the Project's construction phase are not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, either directly or indirectly.

13.8.9 INDIRECT EFFECTS OF IMPACTS ON PREY AVAILABILITY

13.8.9.1 During the construction phase of the Offshore Project, marine mammals may be susceptible to indirect effects from impacts on prey availability. Marine mammals primarily prey on fish species, cephalopods and shellfish, which may be affected by underwater noise or physical impacts of construction. The significance of effects on fish species during construction is assessed within **Chapter 12, Volume 2a** whereby the following impacts are assessed:

- Temporary seabed habitat loss and/or disturbance;
- Increases in suspended sediment concentration and associated sediment deposition;
- Underwater noise and vibration;
- Release of drilling muds during trenchless construction.

13.8.9.2 The significance of effects on cephalopod and shellfish species during construction is assessed within **Chapter 11, Volume 2a** whereby the following impacts are assessed:

- Temporary seabed habitat loss and/or disturbance;
- Temporary increase in suspended sediment concentration and turbidity;
- Temporary increase in sediment deposition from mobilised sediment;
- Disturbance from underwater noise and vibration;
- Release of drilling fluid mud, drilling arisings or bentonite;
- Introduction and colonisation of infrastructure by invasive non-native species;
- Potential effects on benthic habitats through fishing restrictions.

13.8.9.3 The maximum design scenario relating to indirect effects of impacts on prey availability during the construction phase is presented in **Table 13-24**.

13.8.9.4 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.8.9.5 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.8.9.6 For impacts on fish receptors, the significance of all construction-phase effects was assessed as either **Negligible** or **Minor** (dependent upon species or species group), which are not significant in EIA terms, except for those discussed below.

13.8.9.7 For impacts relating to underwater construction noise, TTS and behavioural effects were assessed as being **Minor** to **Moderate** (not significant) for Hearing Group 3 (Atlantic cod, blue whiting, whiting, Norway pout, saithe, blue ling, ling, European hake, roundnose grenadier and European eel) and Hearing Group 4 (Atlantic herring, European sprat and European pilchard). For individually-assessed species, TTS effects were assessed as **Moderate** (potentially significant) for Atlantic salmon for individuals migrating to natal rivers but **Minor** (not significant) for other individuals, and **Moderate** (not significant) for European eel.

13.8.9.8 Despite the potentially significant result of TTS on Atlantic salmon migrating to their natal rivers, the high mobility and varied diets of marine mammals suggest that the magnitude of effect of prey availability would be **Low**. In addition to the above summaries, this magnitude conclusion is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

13.8.9.9 For impacts on cephalopod and shellfish receptors, the significance of all construction-phase effects was assessed as either **Negligible** or **Minor Adverse** (dependent upon species/species group and impact), which are not significant in EIA terms. The only exception was for potential effects on benthic habitats through fishing restrictions in the construction phase, which was assessed as either **Negligible** or **Minor Beneficial**.

Sensitivity of receptor

13.8.9.10 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High Value receptors

13.8.9.11 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international *legislations* and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.8.9.12 Changes in prey availability can result in reduced foraging opportunity and nutritional stress which can lead to long-term energetic consequences for marine mammals (Hastie *et al.*, 2021; Spitz *et al.*, 2018). *However*, marine mammals are wide ranging and generally feed on a range of prey species (HWDT, 2018; Reid *et al.*, 2003). Given their high mobility, marine mammals are able to forage in alternative areas, though they risk foraging for less desirable prey species and higher energetic costs to finding food. Spending longer and travelling further to find prey can also result in less time to spend resting or socialising. If individuals fail to consume sufficient amounts of food, long-term effects may occur through prolonged energy deficit (Booth *et al.*, 2023; Spitz *et al.*, 2018).

13.8.9.13 As discussed in Section 13.6.1, the diet of marine mammals tends to be varied, and all species considered in this assessment have a generalist diet and forage on a variety of prey species. All species are, therefore, likely able to adapt to localised short-term changes in prey availability by foraging *elsewhere* or choosing alternative prey species.

13.8.9.14 To conclude, given that marine mammals are able to adapt to changing prey availability without long-term population consequences, the sensitivity of all marine mammal receptors scoped *into* this assessment is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.8.9.15 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) include the development of a Cable Installation Plan (M002), the development of an OEMP (M019), stakeholder engagement relating to Underwater Noise (see **Table 13-2**), adherence to industry best practice with regard to accidental release of contaminants (M004), best practice techniques for seabed excavations (M005) and production of a MPCP (M031) to reduce indirect impacts of impacts on prey availability. Overall, it is predicted that the magnitude impact of indirect impacts of impacts on prey availability on Marine Mammals is **Low**, and the sensitivity is **Low**. The effect is **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.8.9.16 Given that the assessment of Risso's dolphin within the Study Area showed a **negligible** effect in terms of prey availability, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be negligible and not significant. It is therefore considered that effects on prey availability during the Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.8.9.17 Given that the Sea of the Hebrides MPA is over 80 km to the south of the Array Area, it is considered that the Offshore Project's construction phase is not capable of affecting prey availability *of* the protected feature (minke whale) of Sea of the Hebrides MPA, either directly or indirectly.

Further Environmental Mitigation and Residual Effect

13.8.9.18 No *additional* Marine Mammal mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the embedded commitments outlined in Section 13.7.2) is not significant in EIA terms.

13.9 ASSESSMENT OF EFFECTS: OPERATION AND MAINTENANCE

13.9.1 DISTURBANCE FROM TURBINE NOISE

13.9.1.1 During the operational phase, there is potential for disturbance, displacement, and/or modifications of behaviour as a result of underwater noise and vibration produced by operating WTGs. The origin of the noise is the radiating area of the foundation in the water column and vibrations from rotating machinery in the WTGs transmitted into the sea through the foundations

13.9.1.2 The maximum design scenario relating to disturbance from turbine noise during the O&M phase is presented in **Table 13-24**.

13.9.1.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.1.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.1.5 Effects of underwater noise during the operational phase can be difficult to assess given that some effects may still be felt from the construction phase, such as displacement from construction noise. Operational noise from WTGs is low frequency, between 0.5 Hz and 2 kHz (Marmo *et al.*, 2013), with noise primarily being below 1 kHz (Thomsen *et al.*, 2006). Operational turbine noise is low both on a relative and absolute scale, and source levels are not believed to exceed 145 dB re 1 µPa (RMS), dropping to <120 dB re 1 µPa (RMS) at 100 m from the source (Marmo *et al.,* 2013) (see **Appendix 13.3, Volume 2c** for a definition of noise metrics). WTGs may generate noise continuously throughout the operational phase of a project.

13.9.1.6 Any noise generated could impact marine mammal receptors if the sound falls within hearing ranges, however given that the marine environment has a relatively high level of ambient noise, any noise generated by operational WTGs is likely to only be audible within a few meters of devices (Marmo *et al.*, 2013). Monitoring of ambient sound at the site between January 2024 and February 2025 revealed that January 2024 had the highest sound levels across all frequencies (median ambient SPL (RMS) of 91.8-98.1 dB re 1 µPa), with levels showing clear tidal and spring-neap-cycle patterns (**Appendix 13.2, Volume 2c**). Disturbance may occur in areas where noise exceeds ambient noise levels, which, in high wind speeds (e.g. 10-15 m/s), can be as far as 18.84 km from monopile foundations (Marmo *et al.*, 2013).

13.9.1.7 Increases in continuous noise level from operational WTGs are likely to be minimal and fall within the natural range of variation in baseline noise levels (Norro *et al.*, 2011). The magnitude of effects of disturbance from turbine noise during the operation phase is therefore assessed as **Low**. This is based on the guidance for magnitude which states that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity or value of receptor

13.9.1.8 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High Value receptors

13.9.1.9 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Very-high-frequency cetaceans

13.9.1.10 Harbour porpoises, as VHF cetaceans, are less sensitive to LF sound compared to other hearing groups, and avoidance ranges estimated within Marmo *et al.* (2013) predicted that most harbour porpoises were not expected to respond to operational wind turbine noise, particularly at lower wind speeds.

13.9.1.11 A report published by Leemans and Fijn (2024) on the Borssele OWF gave conflicting results. It suggested that harbour porpoise utilise areas within OWFs year-round and suggest that an increase in the abundance of porpoise occurs over time. Foraging behaviour was observed within the OWF, with individuals recorded at close distances to turbines. DAS data also included in the study, however, showed that probabilities of observing a harbour porpoise significantly decreased closer to turbines, suggesting individuals avoided the turbines, although numbers stabilised at approximately 500 m away. Long-term monitoring at other wind farm sites in the North Sea showed that harbour porpoises were regularly sighted within operational wind farms, and within 2 years of operation, population levels had returned to regular levels (Diederichs *et al.*, 2008). Further effects of operational OWFs are discussed in relation to harbour porpoise within paragraphs 13.9.4.11 and 13.9.4.12.

13.9.1.12 To conclude, there is evidence to suggest that harbour porpoises may experience disturbance effects from operational offshore wind farms, however the effects are likely to be short-term, and animals may return to the area during operation. Given the high mobility and wide-ranging nature of all species, animals are likely to be able to use other areas for important activities such as foraging, resting, mating and calving. Harbour porpoises have been reported at multiple offshore wind farms utilising infrastructure for foraging, which is likely to be a positive effect and increase successful foraging efforts. The sensitivity of harbour porpoise is therefore classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

High-frequency cetaceans

13.9.1.13 HF cetaceans are less sensitive to low frequency sound compared to other hearing groups, however operational noise from WTGs may be audible up to 15 km away in certain wind conditions (Marmo *et al.*, 2013). There is little information available on the effects of operational WTG noise on the HF *cetaceans* scoped into this assessment, although disturbance effects observed on bottlenose dolphins can be considered for the purposes of this assessment. In a study carried out by Marmo *et al.* (2013), bottlenose dolphins were not predicted to exhibit a behavioural response to the sounds generated under any of the operational wind turbine scenarios and therefore were not considered to be at risk of disturbance or displacement.

13.9.1.14 To conclude, there is evidence to suggest that HF cetaceans may experience disturbance effects from operational offshore wind farms, however the effects are likely to be short-term. Given the high mobility and wide-ranging nature of the species considered, animals are likely to be able to use *other* areas for important activities such as foraging, resting, mating and calving. Furthermore, given that harbour porpoises have a low sensitivity and are potentially of higher risk of disturbance during operation, the sensitivity of HF cetaceans to operational noise is classed as **Negligible**. This is based on the guidelines for sensitivity which states that a receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Low-frequency cetaceans

13.9.1.15 Marine mammal receptors which have specialised LF hearing such as minke, fin and humpback whales are considered to be most sensitive to operational WTG noise and may under certain *environmental* circumstances detect operational noise as far as 18.84 km away (Marmo *et al.*, 2013). Modelling approaches used within Marmo *et al.* (2013) suggest that only 10% of minke whales encountering noise from operational turbines were expected to move away at ranges between 3.7 km and 12.71 km, when wind speed was 15 m/s (Marmo *et al.*, 2013). This modelling used a precautionary approach and, given the relatively low sound levels, few minke whales within the Celtic and Greater North Seas MU would be affected.

13.9.1.16 To conclude, there is evidence to suggest that LF cetaceans may experience disturbance effects from operational offshore wind farms, however the effects are likely to be short-term. Given the high mobility and wide-ranging nature of the species considered, animals are likely to be able to use other areas for important activities such as foraging, resting, mating and calving. Minke, fin and humpback whales may be of a higher sensitivity to operational WTG noise compared to other receptors, and therefore the sensitivity of LF cetaceans to operational noise is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Phocid carnivores in water

13.9.1.17 Grey and harbour seals are less sensitive to LF sound compared to other hearing groups, however operational noise from WTGs may be audible up to 18 km away (Marmo *et al.*, 2013). Disturbance *may* occur in areas where operational noise is audible above ambient noise levels; however, in this study neither species was predicted to exhibit a behavioural response to sounds generated by WTGs under any scenario (Marmo *et al.*, 2013).

13.9.1.18 Tagged grey and harbour seal movements have also been shaped by OWFs, with studies from two wind farms, Alpha Ventus in Germany and Sheringham Shoal in the south-east of the United *Kingdom* (Russell *et al.*, 2014). Some harbour seals were recorded travelling in grid-like movements between WTG generators, with activity concentrated at individual turbines. Given that seals activity travel between WTGs to forage, this suggests that the benefits of increased foraging opportunities outweigh any potential disturbance from underwater noise, and that seals are resilient in their sensitivity to operational noise (Russell *et al.*, 2014).

13.9.1.19 To conclude, there is little evidence that grey and harbour seals experience disturbance effects from operational offshore wind farms, even when audible to them for a considerable distance. Conversely, some studies show seals regularly using wind farms for foraging. Seals are therefore considered to be of a lower sensitivity to LF operational WTG noise, and therefore their sensitivity is **Negligible**. This is based on the guidelines for sensitivity which states that a receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Significance of effect

13.9.1.20 There is potential for disturbance from operational turbine noise to take place during the construction phase of the Offshore Project. Considering the embedded mitigation described in **Table 13-25**, the residual effects of disturbance from piling noise on Marine Mammals receptors are summarised in **Table 13-41**.

North-east Lewis MPA

13.9.1.21 Taking a *precautionary* approach to how far behavioural effects on Risso's dolphin or its prey species might occur, given the evidence summarised above, it is considered that disturbance from operational turbine noise is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.9.1.22 At a *distance* of more than 80 km to the south of the Array Area, it is considered that operational wind turbine noise is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA or its prey species in terms of disturbance, either directly or indirectly.

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Table 13-41 Significance of effect of disturbance from turbine noise to Marine Mammals during the operation and maintenance phase

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Harbour porpoise	Low	Low	N/A	Negligible	**Not significant**	Harbour porpoise are the most sensitive marine mammal receptor to underwater noise, and have a hearing range which overlaps with that of operational wind farms. Harbour porpoise may show avoidance at close distances to operational turbines; however, noise is likely to only be audible within a few meters of turbines, and effects are likely to be short-term and unlikely to influence individuals' ability to carry out activities such as foraging and resting.
White-beaked dolphin	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including white-beaked dolphins, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals' ability to carry out activities such as foraging and resting.

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Common dolphin	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including common dolphins, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals' ability to carry out activities such as foraging and resting.
Bottlenose dolphin	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. Bottlenose dolphins are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals' ability to carry out activities such as foraging and resting.
Risso's dolphin	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						devices. High-frequency cetaceans, including Risso’s dolphins, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals’ ability to carry out activities such as foraging and resting.
Atlantic white-sided dolphin	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including Atlantic white-sided dolphins, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals’ ability to carry out activities such as foraging and resting.
Long-finned pilot whale	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including long-finned pilot whales, are not predicted to exhibit a behavioural response to operational

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals' ability to carry out activities such as foraging and resting.
Killer whale	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including killer whales, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are unlikely to influence individuals' ability to carry out activities such as foraging and resting.
Beaked whale species	Low	Negligible	N/A	Negligible	**Not significant**	The hearing range of high-frequency cetaceans overlaps with operational noise, however given the high ambient noise levels. operational noise is only likely to be audible in close proximity to devices. High-frequency cetaceans, including beaked whale species, are not predicted to exhibit a behavioural response to operational noise are therefore not considered to be at risk of disturbance. Any short-term effects are

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						unlikely to influence individuals’ ability to carry out activities such as foraging and resting.
Minke whale	Low	Low	N/A	Negligible	**Not significant**	The hearing range of low-frequency cetaceans overlaps with operational noise, and they are considered the most sensitive to noise generated throughout WTG operation. Any effects on low-frequency cetaceans such as minke whales are expected to be short-term and are unlikely to influence individuals’ ability to carry out activities such as foraging and resting.
Humpback whale	Low	Low	N/A	Negligible	**Not significant**	The hearing range of low-frequency cetaceans overlaps with operational noise, and they are considered the most sensitive to noise generated throughout WTG operation. Any effects on low-frequency cetaceans such as humpback whales are expected to be short-term and are unlikely to influence individuals’ ability to carry out activities such as foraging and resting.
Fin whale	Low	Low	N/A	Negligible	**Not significant**	The hearing range of low-frequency cetaceans overlaps with operational noise, and they are considered the most sensitive to noise generated throughout WTG operation. Any effects on low-frequency cetaceans such as fin

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						whales are expected to be short-term and are unlikely to influence individuals' ability to carry out activities such as foraging and resting.
Grey seal	Low	Negligible	N/A	Negligible	**Not significant**	Seals are less sensitive to operational noise compared to marine mammals in other hearing groups, however disturbance may occur where noise levels are above ambient noise. Seals have been recorded regularly using offshore wind farms for foraging and therefore may benefit from increased foraging opportunities.
Harbour seal	Low	Negligible	N/A	Negligible	**Not significant**	Seals are less sensitive to operational noise compared to marine mammals in other hearing groups; however disturbance may occur where noise levels are above ambient noise. Seals have been recorded regularly using offshore wind farms for foraging and therefore may benefit from increased foraging opportunities.

13.9.2 DISTURBANCE FROM OTHER OPERATIONAL NOISE

13.9.2.1 O&M activities associated with the Offshore Project, such as vessel movements and cable repairs, will produce underwater noise, which may cause disturbance, avoidance, or other alterations of behaviour in marine mammals.

13.9.2.2 The maximum design scenario relating to disturbance from other operational noise during the O&M phase is presented in **Table 13-24**.

13.9.2.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.2.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.2.5 During the operational phase of the Offshore Project, disturbance of marine mammal receptors may occur due to noise generated by operational and maintenance activities. Other noise associated with construction of the Offshore Project is likely to have a higher magnitude of effects given that construction activities are louder than activities carried out during operation. Taking into account the magnitude of effects for other construction noise, and embedded mitigation measures set out within **Table 13-25**, the magnitude of the impact of disturbance from other operational noise is considered to be **Negligible**. This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population, and a very short-term effect and no changes to population size or future trajectory.

Sensitivity of receptor

13.9.2.6 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High value receptors

13.9.2.7 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.9.2.8 Given that the types of noise to be produced during the operational phase are expected to be the same as the non-piling, construction noise assessed in Section 13.8.4, the sensitivity of marine mammal receptors to noise disturbance in the operational phase is the same as identified in the construction phase (see Section 13.8.4).

Very-high-frequency cetaceans

13.9.2.9 Harbour porpoises may be disturbed and/or displaced from noise-generating construction activities in areas where underwater noise levels are higher than background levels, as noted within Section 13.8.4 (Benhemma-Le Gall *et al.*, 2021). Studies investigating the effect of underwater noise tend to focus on construction activities, as these activities generally produce higher levels of sound and vibration compared to activities carried out in the operational phase. Sensitivity to other operational noise is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

High-frequency cetaceans

13.9.2.10 HF cetaceans may be disturbed from noise generated from other operational activities as noted for construction within Section 13.8.4, where increased noise levels can result in the masking of vocalisations, and reduction in communication and prey detection/foraging opportunities making navigation more difficult. Studies investigating the effect of underwater noise generally focuses on construction activities, as these activities generally produce higher levels of sound and vibration compared to activities carried out in the operational phase. Sensitivity to other operational noise is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Low-frequency cetaceans

13.9.2.11 Underwater noise generated from other operational activities, particularly noise which is of low frequency, has the potential to cause disturbance to minke, humpback or fin whale, as noted for construction within Section 13.8.4. Studies investigating the effect of underwater noise generally focuses on construction activities, as these activities generally produce higher levels of sound and vibration compared to activities carried out in the operational phase. Sensitivity to other operational noise is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Phocid carnivores in water

13.9.2.12 Grey and harbour seals may be disturbed from noise generated from other operational activities as noted for construction within Section 13.8.4. Studies investigating the effect of underwater noise generally focuses on construction activities, as these activities generally produce higher levels of sound and vibration compared to activities carried out in the operational phase. Sensitivity to other operational noise is classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.9.2.13 The development of an OMP (M025) (building on the **Outline OMP**, **Volume 3**) will reduce disturbance from other operation noise. Overall, it is predicted that the magnitude impact of disturbance from other operation noise on Marine Mammals is **Negligible**, and the sensitivity is **Low**. The effect is **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.9.2.14 Disturbance impacts from other operational noise on Risso's dolphins was found to have a **negligible** significance *of* effect. It is therefore considered that other construction noise is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

Sea of the Hebrides MPA

13.9.2.15 Given the position of the Sea of the Hebrides MPA some 80 km to the south of the Array Area, it is *considered* that other operational noise is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA nor any supporting feature upon which minke whale is dependent, in terms of disturbance, either directly or indirectly.

13.9.3 VESSEL COLLISION

13.9.3.1 During the operational phase, vessels and equipment will be used to maintain offshore developments, resulting in a number of Offshore Project vessels being utilised in the region. Despite the increase above baseline levels, the maximum number of vessels used at any one time throughout O&M is predicted to be lower than during the construction phase. Marine mammals are at risk of collision with vessels, which can result in injuries and mortality, with some species being more vulnerable than others. Vessels associated with the operational phase will follow prescribed routes and set transit speeds to reduce the probability of collision. O&M works will follow relevant guidance to minimise the risks of injury.

13.9.3.2 The maximum design scenario relating to vessel collision during the O&M phase is presented in **Table 13-24**.

13.9.3.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.3.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.3.5 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**) which describes the current guidance, such as the Scottish Marine Wildlife Watching Code, with which Project vessels should comply to reduce collision risk.

13.9.3.6 Vessel collision is also discussed as an impact of the construction phase (Section 13.8.5). The vessel traffic baseline, as described by **Chapter 16, Volume 2a**, is summarised in that section, along with a review of global collision data of ships with marine mammals and not repeated here.

13.9.3.7 Offshore Project vessels utilised during O&M may be deployed simultaneously, and include service operation vessels, multifunctional all-purpose vessels and other transport vessels. The maximum design scenario for vessel parameters for the operational phase is outlined in **Table 13-24** and further detailed within **Chapter 16, Volume 2a**.

13.9.3.8 Despite differences in the work being undertaken between the construction and operational phases, the hazard of collision with vessels is largely the same, and its magnitude can be broadly related to the volume of marine traffic. Marginally fewer vessels return trips are planned for each year of the operational phase, and therefore the magnitude of effects of vessel collision is considered to approximately the same as in the construction phase. It is therefore assessed as **Low**. This is based on the guidelines for magnitude which state a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.9.3.9 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High value receptors

13.9.3.10 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and *international* legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.9.3.11 The sensitivity of marine mammal receptors to vessel strike in the operational phase is the same as identified in the construction phase (see paragraph 13.8.5.11).

Harbour porpoise, white-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale and killer whale

13.9.3.12 As noted within paragraph 13.8.5.15, receptors including harbour porpoise, white-beaked dolphin, *common* dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, and grey and harbour seals are all highly mobile and have shown avoidance of vessels, highlighting their ability to detect and move away from oncoming operational vessel traffic (Culloch *et al.*, 2016; Erbe *et al.*, 2019; Onoufriou *et al.*, 2016). Despite a risk of injury from collision with operational vessels, any effects are not likely to be long-term or felt at the population level, and individuals may recover from any sustained injuries. The sensitivity of these species to vessel collision during the operational phase is therefore **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Minke whale, humpback whale, fin whale and beaked whale species

13.9.3.13 As noted within paragraph 13.8.5.17, large and deep-diving cetacean species are more susceptible than smaller cetaceans to vessel collision, due to their larger size, reduced mobility and prolonged time spent at the surface between dives (Laist *et al.*, 2001). Despite a risk of injury from collision with construction vessels, any effects are not likely to be long-term or felt at the population *level*, and individuals may recover from any sustained injuries. The sensitivity of these species to vessel collision during the operational phase is therefore **Medium**. This is based on the guidelines for sensitivity which states that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual's survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.9.3.14 There is potential for vessel collision to take place during the O&M phase of the Offshore Project. *Considering* the embedded mitigation described in **Table 13-25**, the residual effects of disturbance from piling noise on Marine Mammals receptors are summarised in **Table 13-42**.

North-east Lewis MPA

13.9.3.15 Given that the assessment of Risso's dolphin within the Study Area showed a **negligible** risk of injury from *vessel* collision, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be **negligible** and **not significant**. It is therefore considered that vessel collision during the Project's O&M phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.9.3.16 Given that the assessment of minke whale within the Study Area showed a **minor** risk of injury from vessel *collision*, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be **minor** and **not significant**. It is therefore considered that vessel collision during the Project's O&M phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

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Table 13-42 Significance of effect of vessel collision to Marine Mammals during the O&M phase

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Harbour porpoise	Low	Low	M029 and M015	Negligible	**Not significant**	Harbour porpoises are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Harbour porpoises are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
White-beaked dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	White-beaked dolphins are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. White-beaked dolphins are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Common dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Common dolphins are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. White-beaked dolphins are therefore

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						unlikely to be struck by an Offshore Project vessel, and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Bottlenose dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Bottlenose dolphins are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Bottlenose dolphins are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Risso’s dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Risso’s dolphins are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Risso’s dolphins are therefore unlikely to be struck by an Offshore Project vessel, and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Atlantic white-sided dolphin	Low	Low	M029 and M015	Negligible	**Not significant**	Atlantic white-sided dolphins are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Atlantic white-sided

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						dolphins are therefore unlikely to be struck by an Offshore Project vessel, and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Long-finned pilot whale	Low	Low	M029 and M015	Negligible	**Not significant**	Long-finned pilot whales are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Long-finned pilot whales are therefore unlikely to be struck by an Offshore Project vessel, and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Killer whale	Low	Low	M029 and M015	Negligible	**Not significant**	Killer whales are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Killer whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Beaked whale species	Low	Medium	M029 and M015	Minor	**Not significant**	Beaked whale species are more susceptible to vessel collision as they spend prolonged periods at the surface, however they do have the ability to detect and move away from oncoming vessel traffic.

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Beaked whale species are therefore unlikely to be struck by an Offshore Project vessel, and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller cetaceans and seal receptors. Effects on beaked whale species are unlikely to be long-term or felt at the population level.
Minke whale	Low	Medium	M029 and M015	Minor	**Not significant**	Minke whales are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Minke whales do have the ability to detect and move away from oncoming vessel traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Minke whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on minke whales are unlikely to be long-term or felt at the population level.
Humpback whale	Low	Medium	M029 and M015	Minor	**Not significant**	Humpback whales are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Humpback whales do have the ability to detect and move away from oncoming vessel

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Humpback whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on humpback whales are unlikely to be long-term or felt at the population level.
Fin whale	Low	Medium	M029 and M015	Minor	**Not significant**	Fin whales are more susceptible to vessel collision than smaller cetaceans and seals due to their larger size, reduced mobility and prolonged periods spent at the surface. Fin whales do have the ability to detect and move away from oncoming vessel traffic and Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Fin whales are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision, although are of a higher sensitivity than smaller receptors. Effects on fin whales are unlikely to be long-term or felt at the population level.
Grey seal	Low	Low	M029 and M015	Negligible	**Not significant**	Grey seals are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Grey seals are therefore unlikely to be

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.
Harbour seal	Low	Low	M029 and M015	Negligible	**Not significant**	Harbour seals are highly mobile and have the ability to detect and move away from oncoming vessel traffic. Offshore Project vessel movements will comply with legislation and standard best practice and will therefore be more predictable in their movements than non-Offshore Project vessels. Harbour seals are therefore unlikely to be struck by an Offshore Project vessel and have the ability to recover in the unlikely occurrence of a collision. Effects are unlikely to be long-term or felt at the population level.

13.9.4 BARRIER EFFECTS

13.9.4.1 During the O&M phase of the Offshore Project, infrastructure associated with the Offshore Project has the potential to cause barrier effects, which could disrupt the passage of marine mammals and lead to displacement effects such as redistribution or avoidance (Hemery *et al.*, 2024). The reduction in accessibility of a site as a result of offshore infrastructure may result in a physical barrier for marine mammals that travel through the area along migratory pathways or regularly use the area for important behaviours including foraging, resting, mating or calving.

13.9.4.2 The maximum design scenario relating to barrier effects during the O&M phase is presented in **Table 13-24.**

13.9.4.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.4.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.4.5 The magnitude of physical barrier effects on marine mammal receptors is difficult to assess, and varies between species and populations (Boyd, 2004). Studies have suggested that fixed-bottom turbines, such as those being used for the Offshore Project, are less likely than floating WTGs to affect navigation of marine mammals within the Array Area, given that floating inter-array cables are not being used.

13.9.4.6 The physical barrier effect has been studied in relation to seal and harbour porpoise occurrence, where studies have documented species abundance returning to baseline levels post-construction, with animals using turbine bases for foraging opportunities (Iorio-Merlo *et al.,* 2024; Russell *et al.,* 2014; Teilmann and Carstensen, 2012). Understanding of the magnitude of effect for larger, migratory species is more limited; despite this, the expectation is that offshore infrastructure associated with the Offshore Project will not restrict movements around or within the Array Area. The magnitude of barrier effects on all marine mammal species during the operational phase is therefore considered to be **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.9.4.7 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

13.9.4.8 Marine mammals are susceptible to spatial displacement where important habitat areas are disturbed. Positive effects may also result from fixed structures, and some studies investigating the movements of marine mammal presence at fixed-bottom OWFs have shown that some species utilise WTG structures for foraging. Marine mammal responses to offshore infrastructure are species-specific and may affect resident and migratory species differently. Where information is available, impacts are considered below on a species-to-species basis.

High value receptors

13.9.4.9 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

Harbour porpoise, grey seal and harbour seal

13.9.4.10 Harbour porpoise, and grey and harbour seals are present on the west coast of Scotland/*Alba* year-round and therefore may be subject to continuous barrier effects for the duration of the operational phase of the Offshore Project.

13.9.4.11 A gradual increase in harbour porpoise echolocation activity was recorded during the operational phase of the Nysted Offshore Wind Farm, from 11% of baseline levels at the start of operation to 29% of baseline after ten years (Teilmann and Carstensen, 2012). The authors proposed that this increase in activity was due to habituation of porpoises, the reef effect[4] or reduced fishing *providing* opportunities and protection to prey species. A broad-scale decrease in porpoise detections was also reported in the Moray Firth after wind farm construction, with porpoise detections 17.7% lower across wind farm sites at the start of the O&M phase (Iorio-Merlo *et al.*, 2024). No finer-scale reef effects were observed in this study.

13.9.4.12 Positive responses where animals have been attracted to fixed structures have been reported in studies focusing on both harbour porpoises and seals. At the Egmond aan Zee Offshore Wind Farm, an increase in harbour porpoise presence was observed during the operational phase of the wind farm (Scheidat *et al.*, 2009). This study showed that there was a higher number of individuals recorded within the wind farm than outside, potentially due to the reef effect of the WTG foundations and the exclusion of fisheries. Tagged grey and harbour seal movements have also been shaped by OWFs, with studies from 2 wind farms, Alpha Ventus in Germany and Sheringham Shoal in the south-east of the United Kingdom (Russell *et al.,* 2014). Some harbour seals were recorded travelling in grid-like movements between WTG generators, with activity concentrated at individual turbines. The ecological consequences of seals adjusting their behaviour to forage at WTG structures is relatively unknown, however seals repeatedly utilising structures indicates that foraging efforts are successful. A suggested explanation for this is variation in behavioural plasticity

[4] Settlement of invertebrates on a new substrate (usually artificial), which encourages other species to congregate by providing opportunities for feeding, predator evasion and reproduction, in a similar way to a natural coral reef.

within seal populations, which enables some individual seals to exploit alternative and novel habitats (Russell *et al.,* 2014).

13.9.4.13 To conclude, there is evidence to suggest that marine mammals may be susceptible to barrier effects due to the presence of infrastructure in the water column and on the seabed, however given the high mobility and wide-ranging nature of all species, animals are likely to be able to use *other* areas for important activities such as foraging, resting, mating and calving. Harbour porpoise and seal species have been reported at multiple offshore wind farms utilising infrastructure for foraging, which is likely to be a positive effect and increase successful foraging efforts. The sensitivity of harbour porpoise, grey seal and harbour seal is therefore classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

White-beaked dolphin, common dolphin, bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species

13.9.4.14 There are limited studies on how barrier effects due to the presence of offshore wind infrastructure in the water column and on the seabed may impact delphinid and ziphiid (beaked whale) species. Given *the* wide-ranging and mobile nature of white-beaked dolphins, common dolphins, bottlenose dolphins, Risso's dolphins, Atlantic white-sided dolphins, long-finned pilot whales, killer whales and beaked whale species, animals are likely to be able to use other areas for important activities such as foraging, resting, mating and calving. There is sufficient evidence to suggest that infrastructure will not physically block the passage of animals in between WTGs and there is there is adequate space between WTGs for species to pass through at all depths and tidal heights (Reid, 2003).

13.9.4.15 Resident and *local* species that are present across the west coast of Scotland/*Alba* may be subject to barrier effects year-round. Coastal species, such as bottlenose dolphin, which have smaller home ranges, may be more susceptible to localised habitat change, especially if infrastructure is developed in important areas (van Geel, 2016). The population of bottlenose dolphins which are resident to the Sound of Barra/*Barraigh* are site-faithful and have a restricted and localised distribution which covers the southern Outer Hebrides/*Na h-Eileanan Sia*, specifically near the Isle of Barra/*Barraigh* and Uists/*Uibhist* (Grellier and Wilson, 2003; van Geel, 2016).

13.9.4.16 It is assumed that behavioural responses of delphinids and ziphiids would be similar to those of harbour porpoise. In the absence of species-specific data, this can be used as a proxy. The sensitivity of white-*beaked* dolphins, common dolphins, bottlenose dolphins, Risso's dolphins, Atlantic white-sided dolphins, long-finned pilot whales, killer whales and beaked whale species to barrier effects due to the presence of infrastructure is therefore classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Minke whale, humpback whale and fin whale

13.9.4.17 Minke whales, humpback whales and fin whales are migratory species, which are present seasonally along the west coast of Scotland/*Alba,* may be subject to barrier effects during the warmer months in the Hebrides/*Na h-Eileanan Sia* on their journeys between breeding and feeding grounds. There are limited studies on barrier effects from OFW infrastructure on migratory whale species.

13.9.4.18 Considering the size of the largest scoped-in marine mammal receptor, the fin whale, which reaches 17.5-20.5 m in length, there is adequate space between WTGs for whales to pass between them at all depths and tidal heights (Reid, 2003). There is therefore no physical reason that whale species, *including* minke, humpback and fin whales, would not be able to swim freely in the operating wind farm. Specific WTG parameters are described within **Table 13-24** and within **Chapter 3, Volume 1a**.

13.9.4.19 In the absence of species-specific evidence, it is assumed that behavioural responses of minke, humpback and fin whales would be similar to those of other marine mammals. The sensitivity of minke, humpback and fin whale species to barrier effects due to the presence of infrastructure is *therefore* classed as **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.9.4.20 There is potential for barrier effects during the O&M phase of the Offshore Project. Considering the embedded mitigation described in **Table 13-25**, the residual barrier effects on marine mammal receptors are summarised in **Table 13-43**.

North-east Lewis MPA

13.9.4.21 Given that barrier effects are a result of installation of infrastructure in the seabed and water column, it is considered that barrier effects are not capable of affecting the protected feature (Risso's *dolphin*) of North-east Lewis MPA, over 20 km to the northeast of the Array Area, either directly or indirectly.

Sea of the Hebrides MPA

13.9.4.22 Given that barrier effects are a result of installation of infrastructure in the seabed and water column, it is considered that barrier effects are not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, over 80 km to the south of the Array Area, either directly or indirectly.

Table 13-43 Significance of effect of barrier effects to marine mammals during the operation and maintenance phase

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Harbour porpoise	Low	Low	N/A	Negligible	**Not significant**	Harbour porpoises may be subject to continuous barrier effects from the Offshore Project, however, are likely to habituate to the presence of WTGs and may show increased use of the array area to forage. Infrastructure will not physically block animals from passing between WTGs and given the highly mobile and wide-ranging nature of harbour porpoise, animals are likely to be able to use other areas for important activities.
White-beaked dolphin	Low	Low	N/A	Negligible	**Not significant**	White-beaked dolphins are likely to habituate to the presence of WTGs, and given their highly mobile and wide-ranging nature, individuals are likely to be able to use other areas for important activities. Infrastructure will not physically block white-beaked dolphins from passing between WTGs and may provide increased foraging opportunities due to the physical infrastructure in the water column and on the seabed.
Common dolphin	Low	Low	N/A	Negligible	**Not significant**	Common dolphins are likely to habituate to the presence of WTGs, and given their highly mobile and wide-ranging nature, individuals are likely to be able to use other areas for important activities. Infrastructure will not physically block common dolphins from passing between WTGs and may provide increased foraging opportunities due to the physical infrastructure in the water column and on the seabed.

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
Bottlenose dolphin	Low	Low	N/A	Negligible	**Not significant**	Bottlenose dolphins, including coastal populations with smaller home ranges, are likely to habituate to the presence of WTGs, and given that they are highly mobile, individuals are likely to be able to use other areas for important activities. Infrastructure will not physically block bottlenose dolphins from passing between WTGs and may provide increased foraging opportunities due to the physical infrastructure in the water column and on the seabed.
Risso's dolphin	Low	Low	N/A	Negligible	**Not significant**	Risso's dolphins are highly mobile and wide-ranging, and primarily inhabit shelf-edge and deep-water habitats. Risso's dolphins are likely to habituate to the presence of WTGs and are expected to able to use other areas for important activities. Infrastructure will not physically block Risso's dolphins from passing between WTGs.
Atlantic white-sided dolphin	Low	Low	N/A	Negligible	**Not significant**	Atlantic white-sided dolphins are likely to habituate to the presence of WTGs, and given their highly mobile and wide-ranging nature, individuals are likely to be able to use other areas for important activities. Infrastructure will not physically block Atlantic white-sided dolphins from passing between WTGs and may provide increased foraging opportunities due to the physical infrastructure in the water column and on the seabed.
Long-finned	Low	Low	N/A	Negligible	**Not significant**	Long-finned pilot whales are highly mobile and wide-ranging and primarily inhabit offshore deep-water habitats. Long-finned pilot whales are likely to habituate

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
pilot whale						to the presence of WTGs and are expected to able to use other areas for important activities. Infrastructure will not physically block individuals from passing between WTGs.
Killer whale	Low	Low	N/A	Negligible	**Not significant**	Killer whales are likely to habituate to the presence of WTGs, and given their highly mobile and wide-ranging nature, individuals are likely to be able to use other areas for important activities. Infrastructure will not physically block killer whales from passing between WTGs and may provide increased foraging opportunities for some communities due to the physical infrastructure in the water column and on the seabed.
Beaked whale species	Low	Low	N/A	Negligible	**Not significant**	Beaked whale species are highly mobile and wide-ranging, and primarily inhabit deep continental slope habitats. They are likely to habituate to the presence of WTGs and are expected to able to use other areas for important activities. Infrastructure will not physically block beaked whale species from passing between WTGs.
Minke whale	Low	Low	N/A	Negligible	**Not significant**	Minke whales may be subject to seasonal barrier effects during the warmer months. Minke whales are expected to habituate to the presence of WTGs, and have the ability to use other areas for important activities. Infrastructure will not physically block minke whales from passing between WTGs.
Humpback whale	Low	Low	N/A	Negligible	**Not significant**	Humpback whales may be subject to seasonal barrier effects during the warmer months. The species are expected to habituate to the presence of WTGs, and have

Receptor	Magnitude	Sensitivity	Embedded mitigation measures	Significance of effect	Significance	Commentary
						the ability to use other areas for important activities. Infrastructure will not physically block humpback whales from passing between WTGs.
Fin whale	Low	Low	N/A	Negligible	**Not significant**	Fin whales may be subject to seasonal barrier effects during the warmer months. They are expected to habituate to the presence of WTGs, and have the ability to use other areas for important activities. Fin whales are the largest marine mammal receptor scoped into the assessment, and there is adequate space between WTGs for whales to pass through at all depths and tidal heights.
Grey seal	Low	Low	N/A	Negligible	**Not significant**	Grey seals may be subject to continuous barrier effects from the Offshore Project, however, are likely to habituate to the presence of WTGs and may show increased use of the array area to forage. Infrastructure will not physically block animals from passing between WTGs and given the highly mobile and wide-ranging nature of grey seal, animals are likely to be able to use other areas for important activities if required.
Harbour seal	Low	Low	N/A	Negligible	**Not significant**	Harbour seals may be subject to continuous barrier effects from the Offshore Project, however, are likely to habituate to the presence of WTGs and may show increased use of the array area to forage. Infrastructure will not physically block animals from passing between WTGs and given the highly mobile and wide-ranging nature of harbour seal, animals are likely to be able to use other areas for important activities if required.

13.9.5 LONG-TERM CHANGES IN HABITAT AND FORAGING OPPORTUNITIES

13.9.5.1 Physical presence of Offshore Project infrastructure, noise from operational activities, and underwater noise from vibration of operating turbines has the potential to cause long-term changes in habitat and foraging opportunities, which could displace marine mammals and reduce the amount of available foraging opportunities. In addition to loss of foraging opportunities, persistent changes or loss of important habitat areas can influence other key life cycle activities such as mating, calving or pupping.

13.9.5.2 The maximum design scenario relating to long-term changes in habitat and foraging opportunities during the O&M phase is presented in **Table 13-24**.

13.9.5.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.5.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.5.5 The magnitude of impact takes into account the Offshore Project's embedded mitigation (**Table 13-25**), which describes the mitigation measures in place to reduce effects to marine mammal receptors. The magnitude of impact is dependent on the extent of habitat disturbance during the operational phase, whereby natural habitats such as circalittoral rock are replaced by artificial substrate. As a result of habitat loss or change, fish receptors which are a source of food for marine mammals may be affected, and therefore the magnitude of effects on marine mammals is dependent on the extent of effects to fish species.

13.9.5.6 Seabed loss/disturbance effects on fish receptors are presented within **Chapter 12, Volume 2a**. In this chapter, the magnitude of effect was assessed as low, and the sensitivity of fish receptors was high to negligible. The significance of effect was therefore classed as minor or negligible, neither of which is significant in EIA terms.

13.9.5.7 Given that effects on fish receptors are not significant in EIA terms, the magnitude of effects of long-term changes in habitat and foraging opportunities on marine mammal receptors is **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.9.5.8 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High value receptors

13.9.5.9 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.9.5.10 Changes in local habitat and prey availability as a result of the Offshore Project's operational phase has the potential to affect marine mammals. Long-term habitat loss may result from the installation of WTG and OSP foundations (where required), along with associated scour protection and cable protection. Habitat loss has the potential to degrade or remove sensitive fish habitats, including foraging, spawning, and nursery areas, and effects to fish receptors may have secondary effects on marine mammals that forage in the region.

13.9.5.11 Long-term changes in foraging opportunities can result in reduced foraging efficiency and nutritional stress which can lead to long-term energetic consequences for marine mammals (Hastie *et al.*, 2021; Spitz *et al.*, 2018). Given their high mobility, marine mammals are able to forage in alternative areas, though they risk foraging for less desirable prey species and higher energetic costs to finding food. Spending longer and travelling further to find prey can also result in less time to spend resting or socialising. If individuals fail to consume sufficient amounts of food, long-term effects may occur through prolonged energy deficit (Booth *et al.*, 2023; Spitz *et al.*, 2018).

13.9.5.12 As discussed in Section 13.6.1, the diet of marine mammals tends to be varied, and all species *considered* in this assessment have a generalist diet and forage on a variety of prey species (see Section 13.6.1 for individual species accounts). The sensitivity of all marine mammal receptors scoped into this assessment is therefore classed as **Low**. This is based on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.9.5.13 The Offshore *Project* embedded mitigation measures (as shown in **Table 13-25**) includes the development of a Cable Installation Plan (M002), the development of an OMP (M025) (building on the **Outline OMP**, **Volume 3**), stakeholder engagement relating to Underwater Noise (see **Table 13-2**), adherence to industry best practice with regard to accidental release of contaminants (M004), production of a MPCP (M031), best practice techniques for seabed excavations (M005) to reduce long-term changes in habitat and foraging opportunities. Overall, it is predicted that the magnitude impact of long-term changes in habitat and foraging opportunities on Marine Mammals is **Low**, and the sensitivity is **Low**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.9.5.14 Given that the assessment of Risso's dolphin within the Study Area showed a **negligible** risk of long-term *changes* in habitat and foraging opportunities, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be **negligible** and **not significant**. It is therefore considered that long-term changes in habitat and foraging opportunities during the Project's construction phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.9.5.15 Given that the assessment of minke whale within the Study Area showed a **negligible** risk of long-term changes in habitat and foraging opportunities, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be **negligible** and **not significant**. It is therefore considered that long-term changes in habitat and foraging opportunities during the Project's construction phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

13.9.6 ACCIDENTAL RELEASE OF POLLUTANTS

13.9.6.1 Accidental pollutant spills from O&M activities may negatively impact marine mammal populations through prolonged exposure to chemical pollutants, ingestion of contaminated prey and habitat degradation. Pollutants may enter the marine environment as the result of a single accidental spill or leak of substances such as hydraulic oils or lubricants, or long-term leaching of chemical pollutants such as coatings of paint on ship hulls, which break down and are released into the marine environment (Hengstmann *et al.*, 2025; Lazuga, 2024). Embedded mitigation, such as the development of an OMP (M025) (building on the **Outline OMP**, **Volume 3**), which complies with requirements and best practices in accordance with the MARPOL and SOPEPs, will reduce the likelihood and minimise the impact of any accidental release of pollutants from vessels and equipment.

13.9.6.2 The maximum design scenario relating to accidental release of pollutants during the O&M phase is presented in **Table 13-24**.

13.9.6.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.6.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.6.5 During the operational phase of the Offshore Project, accidental release of pollutants is a potential risk for marine mammal receptors, although of a marginally lesser magnitude than during construction, given that fewer vessels will be used within the operational phase. The maximum parameters associated with accidental release of pollutants are included within **Table 13-24**. Through regular maintenance and checks, any spills are unlikely to occur; the most likely pollution incident would be slow leaks of fluids, which, if managed accordingly, would be remedied quickly and only small amounts of fluid would escape into the marine environment, which would quickly disperse. Accidental release of pollutants is unlikely to have widespread or long-lasting impacts due to the embedded mitigation measures stated within **Table 13-25** which will reduce the likelihood and minimise the impact of any accidental release of pollutants from vessels and equipment. The magnitude of change for release of accidental release of pollutants is therefore **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity of receptor

13.9.6.6 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12.**

High value receptors

13.9.6.7 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change. The sensitivity of marine mammal receptors to accidental release of pollutants in the operational phase is the same as identified in the construction phase (see Section 13.8.7) and is therefore only summarised here, for ease of reference.

13.9.6.8 As noted within paragraph 13.8.7.6, marine mammals may be sensitive to acute and chronic exposure through the respiratory system or ingestion of contaminated prey. They can also be negatively affected by the impacts associated with a clean-up effort, such as increased vessel traffic (Helm *et al.*, 2015). If pollutants were to be released into the marine environment in large quantities, the effect on receptors may result in permanent injury or mortality and lead to population-level effects. However, as this type of offshore development is unlikely to result in a large-scale pollution incident (such as an oil spill), and as marine mammals are highly mobile and have the ability to move away from localised pollutants, the sensitivity of all marine mammal receptors scoped into this assessment is classed as **Medium**. This is based on the guidelines for sensitivity which state that a receptor has limited ability to recover, adapt or tolerate an impact, which may result in an effect on an individual’s survival and/or reproductive rate (e.g. vital rates).

Significance of effect

13.9.6.9 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) includes the development of an OMP (M025) (building on the **Outline OMP**, **Volume 3**), adherence to industry best practice with regard to accidental release of contaminants (M004), production of a MPCP (M031), and best practice techniques for seabed excavations (M005) to reduce accidental release of pollutants. Overall, it is predicted that the magnitude impact of accidental release of pollutants on

Marine Mammals is **Low**, and the sensitivity is **Medium**. The effect is of **Minor**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.9.6.10 Given that the assessment of Risso's dolphin within the Study Area showed a minor effect from accidental release of pollutants, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be **Minor** and **Not Significant**. It is therefore considered that accidental release of pollutants during the Project's O&M phase is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.9.6.11 Given that the assessment of minke whale within the Study Area showed a minor effect of accidental release of *pollutants*, the risk within the Sea of the Hebrides MPA is considered to be no greater than this and, as a precautionary measure, is also predicted to be **Minor** and **Not Significant**. It is therefore considered that accidental release of pollutants during the Project's O&M phase is capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, but insignificantly.

13.9.7 INCREASES IN SUSPENDED SEDIMENT CONCENTRATION AND REDUCTION IN WATER QUALITY

13.9.7.1 During the operational phase, increases in suspended sediment and reductions in water quality caused by Offshore Project activities may negatively impacts marine mammal populations both directly and indirectly. Reductions in water quality, increases in suspended sediments in the water column and release of contaminated sediments may occur as a result of sediment re-suspension around structures, leading to sediment plumes and a reduction in water quality. Implications to marine mammals include reductions in foraging success due to visual impairment or negative impacts on the health of prey species.

13.9.7.2 The maximum design scenario relating to increases in suspended sediment concentration and reduction in water quality during the O&M phase is presented in **Table 13-24**.

13.9.7.3 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.7.4 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.7.5 During the O&M phase, sediment may be disturbed at the seabed from maintenance activities such as routine inspections, repair or replacement of scour protection and cables and removal of marine growth, resulting in increased suspended sediment (see **Table 13-24**). This is not likely to exceed current baseline levels given the high energy environment which regularly stirs up sediment, particularly during winter storm events. Any increase in suspended sediment concentrations is also likely to be highly temporary and rapidly dissipate within the marine environment. The main causes and effects relating to increases in suspended sediment concentration and a reduction in water quality is detailed in **Chapter 10, Volume 2a**. Secondary effects through impacts to prey species are detailed within **Chapter 11, Volume 2a** and **Chapter 12, Volume 2a**.

13.9.7.6 The magnitude of impacts on marine mammals during O&M is dependent on factors discussed within **Chapter 10, Volume 2a**. The assessment concluded that the significance of effect of changes in suspended sediment concentration and changes in contaminant concentrations was **Minor** or **Negligible**. As a result, the significance of all impacts was assessed as not significant in EIA terms.

13.9.7.7 The magnitude of increases in suspended sediment concentration and reduction in water quality on marine mammals is therefore assessed as **Negligible**. This is based on the guidelines for magnitude which state a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population, and very short-term effect and no changes to population size or future trajectory.

Sensitivity of receptor

13.9.7.8 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High value receptors

13.9.7.9 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.9.7.10 The *sensitivity* of marine mammal receptors to increases in suspended sediments in the operational phase is the same as identified in the construction phase (see Section 13.8.8) and is therefore only summarised here, for ease of reference

13.9.7.11 As noted within Section 13.8.8, marine mammals are highly tolerant of marine environments with high suspended *sediment* loads and regularly forage in areas with poor visibility. Changes in suspended sediment concentration or reductions in water quality as a result of Offshore Project O&M activities are unlikely to exceed baseline levels and are not likely to affect marine mammals. The sensitivity of marine mammal receptors scoped into this assessment is therefore classed as **Negligible**. This is based on the guidelines for sensitivity which state that a receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Significance of effect

13.9.7.12 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) includes production of a MPCP (M031) and best practice techniques for seabed excavations (M005) to reduce increases in suspended sediment concentration and reduction in water quality. Overall, it is predicted that the magnitude impact of accidental release of pollutants on Marine Mammals is **Negligible**, and the sensitivity is **Negligible**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.9.7.13 The modelled extent of dispersed sediments from cable installation options during the construction phase of the Offshore Project was 6 km from the Array Area and OCAS (**Chapter 10, Volume 2a**). Given that the construction phase presents a highest risk of impact than the O&M phase, and that the North-east Lewis MPA is over 20 km to the northeast of the Array Area, it is considered that increases in suspended sediment concentration and reduction in water quality during the Project's O&M phase are not capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, either directly or indirectly.

Sea of the Hebrides MPA

13.9.7.14 The modelled *extent* of dispersed sediments from cable installation options during the construction phase of the Offshore Project was 6 km from the Array Area and OCAS (**Chapter 10, Volume 2a**). Given that the construction phase presents a highest risk of impact than the O&M phase, and that the Sea of the Hebrides MPA is over 80 km to the south of the Array Area, it is considered that increases in suspended sediment concentration and reduction in water quality during the Project's O&M phase are not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA, either directly or indirectly.

13.9.8 INDIRECT EFFECTS OF IMPACTS ON PREY AVAILABILITY

13.9.8.1 During the operational phase of the Offshore Project, marine mammals may be susceptible to indirect effects from impacts on prey availability. Marine mammals primarily prey on fish species, cephalopods and shellfish, which may be affected by underwater noise or physical impacts during the operational phase. The significance of effects on fish species during O&M is assessed within **Chapter 12, Volume 2a** whereby the following impacts are assessed:

- Seabed habitat loss/disturbance;
- Increases in suspended sediment concentration and associated sediment deposition;
- Underwater noise and vibration;
- Electromagnetic fields;
- Fish aggregation effects.

13.9.8.2 The significance of effects on cephalopod and shellfish species during O&M is assessed within **Chapter 11, Volume 2a** whereby the following impacts are assessed:

- Long-term loss of habitat;
- Long-term habitat disturbance;
- Temporary seabed habitat loss and/or disturbance;
- Temporary increase in suspended sediment concentration and turbidity;
- Temporary increase in sediment deposition;
- Introduction and colonisation of infrastructure by invasive non-native species;
- Electromagnetic field effects from subsea electrical cables;
- Thermal emissions from subsea electrical cables.

13.9.8.3 The maximum design scenario relating to indirect effects of impacts on prey availability during the O&M phase is presented in **Table 13-24**.

13.9.8.4 The magnitude of impact is based on the criteria detailed in Section 13.5.3 and **Chapter 5, Volume 1a**. A description of the likely magnitude of impact on receptors caused by each identified impact is given in the following paragraphs.

Magnitude

13.9.8.5 The magnitude described for each receptor is based on the criteria provided in **Table 13-11**.

13.9.8.6 For impacts on fish receptors, the significance of all O&M-phase effects were assessed as either **Negligible** or **Minor** (dependent upon species or species group), which are not significant in EIA terms.

13.9.8.7 In view of the lack of significant effects on fishes, alongside the high mobility and varied diets of marine mammals, the magnitude of effect of prey availability is considered to be **Low**. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

13.9.8.8 For impacts on cephalopod and shellfish receptors, the significance of all O&M-phase effects was assessed as either **Negligible** or **Minor Adverse** (dependent upon species/species group and impact), which are not significant in EIA terms.

Sensitivity of receptor

13.9.8.9 The sensitivity described for each receptor is based on the criteria provided in **Table 13-12**.

High Value receptors

13.9.8.10 As per paragraph 13.5.3.5, marine mammals are afforded high levels of protection under UK and international legislations and there is no distinction between species regarding their value. Marine mammals are therefore assessed using sensitivity in terms of the ability of a species to tolerate or adapt to change.

13.9.8.11 Changes in prey availability can result in reduced foraging opportunity and nutritional stress which can lead to long-term energetic consequences for marine mammals (Hastie *et al.,* 2021; Spitz *et al.,* 2018). However, marine mammals are wide ranging and generally feed on a range of prey species (HWDT, 2018; Reid *et al.*, 2003). Given their high mobility, marine mammals are able to forage in alternative areas, though they risk foraging for less desirable prey species and higher energetic costs to finding food. Spending longer and travelling further to find prey can also result in less time to spend resting or socialising. If individuals fail to consume sufficient amounts of food, long-term effects may occur through prolonged energy deficit (Booth *et al.*, 2023; Spitz *et al.,* 2018).

13.9.8.12 As discussed in Section 13.6.1, the diet of marine mammals tends to be varied, and all species considered in this assessment have a generalist diet and forage on a variety of prey species. All species are, therefore, likely *able* to adapt to localised short-term changes in prey availability by foraging elsewhere or choosing alternative prey species.

13.9.8.13 To conclude, given that marine mammals are able to adapt to changing prey availability without long-term population consequences, the sensitivity of all marine mammal receptors scoped into this assessment is *classed* as **Low**. This is based on the guidelines for sensitivity which state that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.9.8.14 The Offshore Project embedded mitigation measures (as shown in **Table 13-25**) includes the development of a Cable Installation Plan (M002), the development of an OMP (M025) (building on the **Outline OMP**, **Volume 3**), stakeholder engagement relating to underwater noise (see **Table 13-2**), production of a MPCP (M031) and best practice techniques for seabed excavations (M005) to reduce indirect effects of impacts on prey availability. Overall, it is predicted that the magnitude impact of indirect effects of impacts on prey availability on Marine Mammals is **Low**, and the sensitivity is **Low**. The effect is of **Negligible**, which is **Not Significant** in EIA terms.

North-east Lewis MPA

13.9.8.15 Given that the *assessment* of Risso's dolphin within the Study Area showed a **negligible** effect in terms of prey availability, the risk within the North-east Lewis MPA is considered to be no greater than this and is therefore also predicted to be **negligible** and **not significant**. It is therefore considered that effects on prey availability during the Project's O&M phase is capable of affecting the protected feature (Risso's dolphins) of North-east Lewis MPA, but insignificantly.

Sea of the Hebrides MPA

13.9.8.16 Given *that* the Sea of the Hebrides MPA is over 80 km to the south of the Array Area, it is considered that the Offshore Project's O&M phase is not capable of affecting prey availability of the protected feature (minke whale) of Sea of the Hebrides MPA, either directly or indirectly.

Further Environmental Mitigation and Residual Effect

13.9.8.17 No additional Marine Mammal mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the embedded commitments outlined in Section 13.7.2) is not significant in EIA terms.

13.10 ASSESSMENT OF EFFECTS: DECOMMISSIONING

13.10.1 OVERVIEW

13.10.1.1 Offshore Project activities carried out during the decommissioning phase will largely be a reversal of *activities* carried out during the construction phase. This includes removal of surface and subsurface infrastructure, with the exception of any components in which it is more practical to leave *in situ* and where there is evidence to suggest that this would have negligible long-term effects.

13.10.1.2 WTGs will be removed by reversing the installation methods. The jackets will be removed and piles *cut* 1 m below the seabed level and sections above this removed. Removal of the entire pile is likely to result in disproportionate environmental impacts. However, this will be confirmed via the Decommissioning Programme. Other elements, including scour protection and sections of cable may also be left in place, should disturbance to the seabed habitat be considered inappropriate. However, should all infrastructure be removed, noise-generating activities are likely to be at no greater a magnitude than during the construction phase. Vessel traffic is considered likely to be the same as during the construction phase.

13.10.1.3 Further information on the decommissioning of the Offshore Project is discussed in **Chapter 3, Volume 1a**, however there is currently limited information available as this will be detailed in a Decommissioning *Programme* at a later date. The Decommissioning Programme will be updated regularly to account for updates to the programme and best practices.

13.10.1.4 The worst-case scenario for decommissioning for all activities is equivalent to, or less than during the construction phase. Therefore, the magnitude and sensitivity assessments for the construction phase can also be *applied* to decommissioning. The Offshore Project impacts to marine mammal receptors have been assessed as not significant in EIA terms for all impacts across construction and are not expected to exceed these parameters during decommissioning. Therefore, for all marine mammal receptors and all scoped in impacts, the effects during decommissioning are expected to be not significant in EIA terms.

Further Environmental Mitigation and Residual Effect

13.10.1.5 No additional marine mammal mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the embedded commitments outlined in Section 13.7.2) is not significant in EIA terms.

13.11 ASSESSMENT OF COMBINED EFFECTS

13.11.1.1 The *combined* effects assessment considers likely significant effects from multiple impacts and activities from the construction, O&M, and decommissioning phases of the Offshore Project on the same receptor, or group of receptors. The method used to identify and assess potential Combined Effects in relation to the offshore environment is set out in **Chapter 5, Volume 1a**.

13.11.1.2 Combined *effects* could potentially arise in one of two ways. The first type of combined effect is a Project lifetime effect, where multiple phases of the Project (construction, O&M, and decommissioning) interact to create a potentially more significant effect on a receptor than in one phase alone.

13.11.1.3 The second *type* of combined effect is receptor-led effects. Receptor-led effects are where effects from different environmental aspects combine spatially and temporally on a receptor. These effects may be short-term, temporary, transient, or longer-term. Receptor-led effects have been considered, where relevant, in this chapter for potential interactions between marine mammals and the following environmental aspects:

- **Chapter 10, Volume 2a;**
- **Chapter 11, Volume 2a;**
- **Chapter 12, Volume 2a;**
- **Chapter 16, Volume 2a;**
- **Chapter 21, Volume 2a.**

13.11.1.4 Full results of the Project lifetime effects and receptor-led effects assessment can be found in **Chapter 23: Combined Effects Assessment, Volume 2a**.

13.12 CONSIDERATION OF ONSHORE TRANSMISSION WORKS PROJECT

13.12.1.1 A separate application for the Project's onshore elements (the OTW Project) that includes all infrastructure landwards of Mean Low Water Springs (MLWS) within the Onshore Transmission Works Boundary will be made, under the Town and Country Planning (Scotland) Act 1997 to Comhairle nan Eilean Siar (CnES). The OTW Project EIAR will provide a full description of the onshore elements of the Project landward of MLWS, and include an assessment of the associated likely significant effects.

13.12.1.2 This EIAR has considered the additive interactions between the Offshore Project and OTW Project to understand if there is the potential for any change to the assessment outcomes as a result of both elements of the Project. The approach to identify and consider potential interactions between the Offshore Project and OTW Project is set out in **Chapter 5, Volume 1a** and key design parameters associated with the OTW Project are summarised in **Chapter 3**, **Volume 1a**. The potential for effects identified in **Table 13-5** to interact with effects associated with the OTW Project at a common receptor included within the marine mammal assessment (i.e. receptors which have the potential to experience effects from both projects) has been considered. However, the Zone of Influence associated with Marine Mammals is limited spatially to the marine environment and only has the potential to cause an effect on receptors which are in the marine environment. Further to this, the only activity to occur between MHWS and MLWS are associated with HDD and cable installation that will occur under the seabed. The works above the seabed associated with this (i.e. HDD Exit Pit construction and cable pull through vessel activities) are considered within this chapter already.

13.12.1.3 It has been assumed that there will be negligible impact to onshore rivers/water bodies due to the OTW Project following the incorporation of mitigation measures. For example, this could include the use of HDD techniques for installation of the Onshore Cable through a watercourse. As the works between MHWS and MLWS are below the seabed there is no potential for impact to Marine Mammals receptors. Following consideration of the OTW Project and likely ZOI and influence on common receptors, there are no pathways that have the potential to effect Marine Mammal receptors. As a result of this, there is no pathway for these effects to interact in addition to the OTW Project and this is not considered further.

13.13 ASSESSMENT OF CUMULATIVE EFFECTS

13.13.1 APPROACH

13.13.1.1 A cumulative effects assessment (CEA) examines the potential for impacts of the Offshore Project in addition with other relevant projects, plans, and activities ('Other Developments') (including the OTW project) on the same single *receptor* or resource and the contribution of the Offshore Project to those impacts. This involves a systematic approach, generally divided into screening and assessment stages. The overall method followed in identifying and assessing potential cumulative effects in relation to the offshore environment is set out in **Chapter 5, Volume 1a**.

13.13.1.2 The *offshore* screening approach is based on the Planning Inspectorate's Advice Note Nine (Planning Inspectorate, 2018) and Advice Note Seventeen (Planning Inspectorate, 2024), with relevant components of the RenewableUK (RenewableUK, 2013) accepted guidance, which includes aspects specific to the marine elements of an offshore wind farm, addressing the need to consider mobile wide-ranging species (foraging species, migratory routes, etc.).

13.13.1.3 The conclusions of the assessment of the Offshore Project and any additional effect arising from the OTW Project as identified in this chapter have been considered in this CEA. However, given the assumed mitigation and conclusion drawn within Section 13.12 there are no material additional impacts resulting from the OTW Project.

13.13.1.4 For marine mammals, ZOIs have been applied to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The screening approach is based on the two types of ZOI described in Section 13.4.2. This provides a proportionate assessment by considering the following:

- Impact pathways with more localised effects, such as disturbance from vessels or pollution events, have a smaller ZOI and are considered within the marine mammal Study Area, which is an area comprising the Array Area and OCAS, with a 100 km buffer;
- Wider ranging noise impact pathways are assessed using species-specific MUs and SMUs. The marine mammal ZOIs (relating to species-specific MUs and SMUs) are shown in **Figure 13.1, Volume 2b**.

Longlisting process

13.13.1.5 A longlisting process was undertaken to identify all projects falling within the UK portions of MUs/SMUs relevant to the Offshore Project. As the largest unit with the broadest reach, the boundaries of the CGNS MU encompass those of all other MUs and SMUs, thus providing a maximum spatial template for the longlist.

Shortlisting process

13.13.1.6 Following this step, a short list of Other Developments that may interact with the Project ZOIs during their construction, operation, or decommissioning is presented in **Appendix 5.3: Cumulative Effects Assessment Shortlisted Developments, Volume 1c** and on **Figure 13.28, Volume 2b**. This list has been generated by applying criteria set out in **Chapter 5, Volume 1a** and following shortlisting process.

13.13.1.7 The shortlist was developed by screening out Other Developments within the CGNS MU for which there was:

- No conceptual effect-receptor pathway;
- Low data confidence or availability;
- No physical effect-receptor overlap; or
- No temporal overlap.

13.13.1.8 The only type of Other Development screening in with the potential to result in cumulative effects on marine mammals was considered to be offshore wind farms, which are related to the wider ranging noise impact pathways being assessed using species-specific MUs and SMUs. This is because no Other Developments within the 100km Study Area presented the potential for cumulative effects from other impact pathways.

13.13.1.9 Following the shortlisting process, a final step then considered which offshore wind farms fell into each MU/SMU to ensure that the cumulative assessment assigned Other Developments to the relevant MU/SMU for the species-specific assessment (see **Table 13-45**).

Approach to cumulative assessment for piling impact pathways

13.13.1.10 The cumulative assessment of impact pathways associated with piling noise (the second spatial scope listed above) required that a scoping report or EIAR had been submitted to planning, in order to provide enough detail on piling schedule. This was necessary to understand the temporal overlap of Other Developments with the Offshore Project. NatureScot confirmed in post-Scoping advice (**Table 13-4**) that only Scottish offshore wind farms within the MUs should be scoped into the CEA and that, of those, only offshore wind farms with a year of piling either side of the Offshore Project's piling years should be included. Numbers of affected animals across all scoped-in Other Developments were compiled for each receptor (where available). For Other Developments where no EIAR had yet been submitted and numbers of disturbed animals therefore not yet presented, an effective deterrence range (EDR) appropriate to the engineering approach for each project was used to calculate the area of impact, in line with JNCC guidance (JNCC, 2020). This area was then multiplied by the SCANS-IV density for each species, to give an estimate of numbers of disturbed animals.

13.13.1.11 Population-level effects of pile driving-related impact pathways were then quantified with iPCoD modelling, for the 5 species for which parameters were available. This was only carried out for pile-driving-related impacts, as this is the specific function of iPCoD, as outlined in Section 13.5.4. The iPCoD modelling is presented in **Appendix 13.4, Volume 2c**.

13.13.2 CUMULATIVE EFFECTS ASSESSMENT

13.13.2.1 On the basis of the approach set out in Section 13.13.1 above, the Other Developments that are scoped into the Marine Mammals CEA are outlined in **Table 13-44**. **Table 13-45** identifies the species specific MUs and SMUs the Other Developments fall within, as described in Section 13.13.1. Green colour coding in **Table 13-45** indicates that the Other Development falls within the MU/SMU named in the column headings of the table. Red colour coding indicates that it lies outside the MU/SMU.

Table 13-44 Other Developments considered as part of the Marine Mammal CEA

ID (Figure 13.28)	Development type	Application reference	Description of development	Status	Timescale[5]	Confidence in assessments	Tier[6]	Distance to the Array Area (km)	Distance to the OCAS (km)
1	Offshore Wind Farm	OWF-024	Talisk Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2029, become operational in 2032 and decommissioned in 2077.	Medium	2	28	32
2	Offshore Wind Farm	OWF-026	Havbredey Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2030, become operational in 2035 and decommissioned in 2060.	Medium	2	55	55
3	Offshore Wind Farm	OWF-027	West of Orkney Offshore Wind Farm	Consented	Construction is anticipated to begin in 2027, become operational in 2029 and decommissioned in 2059.	High	1	128	126
4	Offshore Wind Farm	OWF-028	Caledonia Offshore Wind Farm	Consented	Construction is anticipated to begin in 2027, become	High	1	228	224

[5] The Planning Inspectorate Advice Note 17 states '*Where other developments are expected to be completed before construction of the proposed Major Infrastructure Project and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of both the construction and operational assessment*.'

[6] *Chapter 5 sets out the full definitions of the tiers. Tier 1: high level of certainty or information availability (including under construction or where a planning application has been approved or is awaiting decision). Tier 2: medium level of certainty or information (such as developments where a Scoping Report has been submitted). Tier 3: low level of certainty or information available (no planning applications submitted or identified for potential future development only).*

ID (Figure 13.28)	Development type	Application reference	Description of development	Status	Timescale[5]	Confidence in assessments	Tier[6]	Distance to the Array Area (km)	Distance to the OCAS (km)
					operational in 2030 and decommissioned in 2065.				
5	Offshore Wind Farm	OWF-021	Machair Wind Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2026 and become operational in 2031.	Medium	2	240	245
6	Offshore Wind Farm	OWF-023	Ayre Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2029, become operational in 2034 and decommissioned in 2069.	Medium	2	248	246
7	Offshore Wind Farm	OWF-017	Stromar Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2030, become operational in 2037 and decommissioned in 2062.	Medium	2	251	248
8	Offshore Wind Farm	OWF-018	Broadshore Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2031, become operational in 2034 and decommissioned in 2059.	Medium	2	277	273
9	Offshore Wind Farm	OWF-034	Sinclair Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2031, become operational in 2034 and decommissioned in 2059.	Medium	2	282	278
10	Offshore Wind Farm	OWF-035	Scaraben Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2031, become operational in 2034 and decommissioned in 2059.	Medium	2	288	283

ID (Figure 13.28)	Development type	Application reference	Description of development	Status	Timescale[5]	Confidence in assessments	Tier[6]	Distance to the Array Area (km)	Distance to the OCAS (km)
11	Offshore Wind Farm	OWF-016	Buchan Offshore Wind Farm	In Planning - Application Submitted	Construction is anticipated to begin in 2030, become operational in 2034 and decommissioned in 2069.	High	1	307	303
12	Offshore Wind Farm	OWF-020	MarramWind Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2028, become operational in 2036 and decommissioned in 2080.	Medium	2	338	333
13	Offshore Wind Farm	OWF-046	Seagreen 1A Offshore Wind Farm	Consented	Construction is anticipated to begin in 2020, become operational in 2023 and decommissioned in 2058.	High	1	341	334
14	Offshore Wind Farm	OWF-014	Bowdun Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2029, become operational in 2034 and decommissioned in 2069.	Medium	2	346	340
15	Offshore Wind Farm	OWF-025	Muir Mhor Offshore Wind Farm	In Planning - Application Submitted	Construction is anticipated to begin in 2030, become operational in 2034 and decommissioned in 2079.	High	1	364	359
16	Offshore Wind Farm	OWF-009	Berwick Bank Offshore Wind Farm	Consented	Construction is anticipated to begin in 2025, become operational in 2033 and decommissioned in 2068.	High	1	370	363

ID (Figure 13.28)	Development type	Application reference	Description of development	Status	Timescale[5]	Confidence in assessments	Tier[6]	Distance to the Array Area (km)	Distance to the OCAS (km)
17	Offshore Wind Farm	OWF-032	Morven Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2028, become operational in 2035 and decommissioned in 2060.	Medium	2	370	364
18	Offshore Wind Farm	OWF-043	Aspen Offshore Wind Farm	In Planning – Application Submitted	Construction is anticipated to begin in 2028, become operational in 2031 and decommissioned in 2066.	High	1	371	366
19	Offshore Wind Farm	OWF-015	Ossian Offshore Wind Farm	In Planning - Application Submitted	Construction is anticipated to begin in 2031, become operational in 2038 and decommissioned in 2073.	High	1	387	380
20	Offshore Wind Farm	OWF-022	CampionWind Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2030, become operational in 2040 and decommissioned in 2065.	Medium	2	394	388
21	Offshore Wind Farm	OWF-030	Arven South Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2030, become operational in 2034 and decommissioned in 2059.	Medium	2	392	392
22	Offshore Wind Farm	OWF-033	Arven Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2030, become operational in 2034 and decommissioned in 2059.	Medium	2	409	409

ID (Figure 13.28)	Development type	Application reference	Description of development	Status	Timescale[5]	Confidence in assessments	Tier[6]	Distance to the Array Area (km)	Distance to the OCAS (km)
23	Offshore Wind Farm	OWF-019	Bellrock Offshore Wind Farm	In Planning - Scoping Report Submitted	Construction is anticipated to begin in 2029, become operational in 2032 and decommissioned in 2057.	Medium	2	421	415
24	Offshore Wind Farm	OWF-040	Cenos Offshore Wind Farm	In Planning - Application Submitted	Construction is anticipated to begin in 2030, become operational in 2035 and decommissioned in 2070.	High	1	491	486

Table 13-45 Other developments categorised by MU or SMU (green indicates inclusion and red exclusion)

ID	Description of development	Western Scotland MU	Celtic and Greater North Seas MU	Coastal West Scotland and Hebrides MU	Oceanic Waters MU	Western Isles SMU
1	Talisk Offshore Wind Farm					
2	Havbredey Offshore Wind Farm					
3	West of Orkney Offshore Wind Farm					
4	Caledonia Offshore Wind Farm					
5	Machair Wind Offshore Wind Farm					
6	Ayre Offshore Wind Farm					
7	Stromar Offshore Wind Farm					
8	Broadshore Offshore Wind Farm					
9	Sinclair Offshore Wind Farm					
10	Scaraben Offshore Wind Farm					
11	Buchan Offshore Wind Farm					
12	MarramWind Offshore Wind Farm					
13	Seagreen 1A Offshore Wind Farm					
14	Bowdun Offshore Wind Farm					
15	Muir Mhor Offshore Wind Farm					
16	Berwick Bank Offshore Wind Farm					
17	Morven Offshore Wind Farm					
18	Aspen Offshore Wind Farm					
19	Ossian Offshore Wind Farm					
20	CampionWind Offshore Wind Farm					
21	Arven South Offshore Wind Farm					
22	Arven Offshore Wind Farm					
23	Bellrock Offshore Wind Farm					
24	Cenos Offshore Wind Farm					

Activities or impacts scoped out of the cumulative assessment

13.13.2.2 Not all impacts from the Offshore Project are considered within the CEA due to effects being:

- Highly localised; or
- Unlikely to have a cumulative effect due to mitigation measures put in place.

13.13.2.3 Impacts which are not considered within the CEA are presented in **Table 13-46**, with justification provided for scoping out.

Table 13-46 Impacts excluded from the CEA

Impact	Phase	Justification
Auditory injury from piling noise	Construction	Where pile driving could cause auditory injury, mitigation measures including M003 are implemented to protect marine mammals (see **Table 13-25**). With these measures, no PTS is predicted for any marine mammal receptors. The cumulative PTS range for mitigated piling is <100 m for VHF cetaceans and PCW, <50 m for HF cetaceans and 1,500 m for LF cetaceans. Fewer than one individual per species is expected to be affected, representing less than <0.01% of each species within relevant UK MU/SMUs. Thus, there is no credible pathway for significant cumulative effects to occur, and this impact is not considered within the CEA assessment. See Section 13.8.1 for further detail on this impact in relation to the Offshore Project.
Auditory injury from other construction noise	Construction	Auditory injury from other construction activities is expected to be highly localised and no animals are predicted to receive PTS from other construction noise. The PTS extent for non-impulsive construction noise is <100 m for each activity type for each hearing group. The number of animals affected are <1 individual for each marine mammal species. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Section 13.8.3 for further detail on this impact in relation to the Offshore Project.
Disturbance from other construction noise	Construction	Disturbance from other construction noise is expected to be highly localised. The potential for significant cumulative effects is therefore minimal and this impact is not considered within the CEA assessment. See Section 13.8.4 for further detail on this impact in relation to the Offshore Project.
Vessel collision	Construction, O&M	All vessel movements will be managed through implementation of mitigation measures including M029 and M015. Despite the increase in Offshore Project-related vessel traffic, marine mammals are able to

Impact	Phase	Justification
		detect and move away from vessels, and it is predicted that any effects are short-term and not likely to be felt at the population level. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Sections 13.8.5 and 13.9.3 for further detail on this impact in relation to the Offshore Project.
Disturbance or temporary habitat loss from presence of vessels	Construction	Any effects from presence of vessels are expected to be short-term and highly localised, and therefore population-level effects are considered unlikely. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Section 13.8.6 for further detail on this impact in relation to the Offshore Project.
Accidental release of pollutants	Construction, O&M	Mitigation measures are implemented to reduce accidental, small-scale release of pollutants, including M031 and M015. Any release of pollution would be expected to be highly localised, disperse quickly and not result in any population-level effects. Therefore, this impact is not considered within the CEA assessment. See Sections 13.8.7 and 13.9.6 for further detail on this impact in relation to the Offshore Project.
Increases in suspended sediment concentration and reduction in water quality	Construction, O&M	Activities which may cause effects relating to suspended sediment and water quality will be managed through mitigation measures including M005. Any increase in suspended sediment or change in water quality is expected to be highly localised, short-term and not likely to result in population-level effects. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Sections 13.8.8 and 13.9.7 for further detail on this impact in relation to the Offshore Project.
Indirect effects of impacts on prey availability	Construction, O&M	Effects on prey are expected to be highly localised, with marine mammal receptors having the ability to adapt to short-term changes in prey availability. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Sections 13.8.9 and 13.9.8 for further detail on this impact in relation to the Offshore Project.
Disturbance from other operational noise	O&M	Effects from disturbance from other operational noise are expected to be highly localised and are not predicted to have population-level effects. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment.

Impact	Phase	Justification
		See Section 13.9.2 for further detail on this impact in relation to the Offshore Project.
Barrier effects	O&M	Barrier effects on marine mammal receptors are expected to be highly localised and are not predicted to have population-level effects. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Section 13.9.4 for further detail on this impact in relation to the Offshore Project.
Long-term changes in habitat and foraging opportunities	O&M	Effects from long-term changes in habitat and foraging opportunities are expected to be highly localised and are not predicted to have population-level effects. The potential for significant cumulative effects is minimal and therefore this impact is not considered within the CEA assessment. See Section 13.9.5 for further detail on this impact in relation to the Offshore Project.

Activities or impacts scoped into the cumulative assessment

13.13.2.4 The impacts which are considered within the CEA are:

- Disturbance from piling noise;
- Disturbance from turbine noise.

13.13.2.5 The impacts which are considered within the CEA are included because there is potential for significant cumulative effects. These impacts in isolation are not anticipated to have a significant effect on marine mammal receptors, however when considering these activities cumulatively, and their additive magnitude, there is potential for a greater significance of effect that therefore warrants assessment.

Disturbance from piling noise

13.13.2.6 Disturbance from piling noise is scoped into the cumulative assessment given that the extent of the impact for the Offshore Project is not localised. Any disturbance to marine mammal receptors from the Offshore Project's piling noise, in addition to other projects' disturbance from piling noise, may result in potential significant cumulative effects. As per the Project-alone assessment, cumulative disturbance from piling noise is assessed quantitatively, where data exist for the receptor, and qualitatively where densities and/or populations are unknown.

Disturbance from turbine noise

13.13.2.7 Disturbance from turbine noise is scoped into the cumulative assessment given that the nature of the impact is long-term (for the operational life of the Offshore Project), and further mitigation measures are not viable to reduce operational turbine noise. Any disturbance from the Offshore

Project's operational turbine noise, in addition to other projects' disturbance from turbine noise, may result in potential significant cumulative effects. As per the Project-alone assessment, cumulative disturbance from turbine noise is assessed qualitatively for all receptors.

Cumulative project design envelope

13.13.2.8 The maximum design scenarios outlined previously in **Table 13-24** for disturbance from piling noise during construction, disturbance from turbine noise during operation and decommissioning activities have been used for the cumulative assessment.

13.13.3 CUMULATIVE DISTURBANCE FROM PILING NOISE

Magnitude

Harbour porpoise (West Scotland Management Unit)

13.13.3.1 For the cumulative scenario for harbour porpoise in the WS MU, there were 4 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-47**.

Table 13-47 Number of harbour porpoise (WS MU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	**Tier**	**Source**	**Estimated no. disturbed animals per day, by year and project**									
			2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Spiorad na Mara	**N/A**	**EIAR**					**1,040**	**1,040**				
Havbredey	2	Scoping					70	70	70	70	70	70
Machair Wind	2	Scoping	142	142	142	142	142					
Talisk	2	Scoping				70	70					
West of Orkney	1	EIAR			1,149	1,149	1,149					
Total number			**142**	**142**	**1,291**	**1,361**	**2,471**	**1,110**	**70**	**70**	**70**	**70**
% MU (24,305)			**0.584**	**0.584**	**5.312**	**5.600**	**10.167**	**4.567**	**0.003**	**0.003**	**0.003**	**0.003**

13.13.3.2 iPCoD modelling[7] was undertaken for the WS MU harbour porpoise population for the Offshore Project cumulatively with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for harbour porpoise used in the iPCoD modelling are presented in **Table 13-48**. **Table 13-49** shows that, by the end of 2047 (12 years after cumulative piling ends), the impacted population is predicted to be at 99.49% of the size of the un-impacted population, which means that disturbance has resulted in a 0.06% reduction in mean population size.

[7] See Section 13.5.4 - Population Modelling for further detail on how iPCoD is undertaken.

Table 13-48 Number of harbour porpoise in the WS MU disturbed per piling day per project OWF development in the cumulative iPCoD simulation.

OWF development	Piling years	Number of animals disturbed per day
Spiorad na Mara	**2030-2031**	**1,040**
Havbredey	2030-2035	70 (OSP/reactive compensation station(s) (RCS)), 70 (WTG)
Machair Wind	2026-2030	142
Talisk	2029-2030	70 (OP), 70 (WTG)
West of Orkney	2028-2030	1,149

Table 13-49 Mean un-impacted and impacted population sizes for the WS MU for harbour porpoise in the cumulative iPCoD simulations

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2026 (pre piling)	24,304	24,304	100%
End 2029 (after 4 years cumulative piling)	24,271	24,226	99.81%
End 2030 (end Offshore Project piling year 1)	24,222	24,135	99.64%
End 2031 (end Offshore Project piling year 2)	24,251	24,122	99.47%
End 2035 (end of cumulative piling)	24,286	24,163	99.49%
End 2036 (1 year after cumulative piling ends)	24,246	24,120	99.48%
End 2041 (6 years after cumulative piling ends)	24,167	24,042	99.48%
End 2047 (12 years after cumulative piling ends)	24,123	23,999	99.49%

White-beaked dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.13.3.3 For the cumulative scenario for white-beaked dolphin in the CGNS MU, there were 23 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-50**.

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Table 13-50 Number of white-beaked dolphin (CGNS MU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Spiorad na Mara	**N/A**	**EIAR**					**646**	**646**									
Arven	2	Scoping					125	125	125	125							
Aspen	1	EIAR			3,644	3,644	3,644										
Ayre	2	Scoping					96	96	96	96							
Bellrock	2	Scoping			56	56	56										
Berwick Bank	1	EIAR	516	516	516	516	516	516									
Bowdun	2	Scoping				56	56	56	56								
Broadshore	2	Scoping			125	125	125	125									
Buchan	1	EIAR						2,695	2,695	2,695	2,695						
Caledonia	1	EIAR			2,873	2,873	2,873										
CampionWind	2	Scoping					56	56	56	56	56	56	56	56	56	56	56
Cenos	1	EIAR						963	963	963							
Havbredey	2	Scoping					181	181	181	181	181	181					
Machair Wind	2	Scoping	0	0	0	0	0										
MarramWind	2	Scoping			125	125	125	125	125	125	125	125	125				
Morven	2	Scoping	56	56	56	56	56	56	56								
Muir Mhòr	1	EIAR				6,750	6,750	6,750									
Ossian	1	EIAR						1,347	1,347	1,347	1,347	1,347	1,347	1,347	1,347		
Scaraben	2	Scoping				125	125	125									
Seagreen 1A	1	Piling Strategy				764	764	764	764								
Sinclair	2	Scoping				125	125	125									
Stromar	2	Scoping			96	96	96	96									
Talisk	2	Scoping				181	181										

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West of Orkney	1	EIAR			1,709	1,709	1,709										
Total number			**572**	**572**	**9,200**	**17,201**	**18,305**	**14,847**	**6,464**	**5,588**	**4,404**	**1,709**	**1,528**	**1,403**	**1,403**	**56**	**56**
% MU/SMU (34,025)			**1.681**	**1.681**	**27.039**	**50.554**	**53.799**	**43.636**	**18.998**	**16.423**	**12.943**	**5.023**	**4.491**	**4.123**	**4.123**	**0.165**	**0.165**

13.13.3.4 No parameters for iPCoD modelling[7] exist for this species. In the absence of population modelling, and given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources, the future trajectory of the species is unknown. However, given the low proportion of the population predicted to be disturbed, population-level effects are considered highly unlikely.

Common dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.13.3.5 For the cumulative scenario for common dolphin in the CGNS MU, there were 23 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-51**.

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Table 13-51 Number of common dolphin (CGNS MU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells; N/A indicates receptor scoped out of Other Development's CEA)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Spiorad na Mara	**N/A**	**EIAR**					**2**	**2**									
Arven	2	Scoping					N/A	N/A	N/A	N/A							
Aspen	1	EIAR			N/A	N/A	N/A										
Ayre	2	Scoping					0	0	0	0							
Bellrock	2	Scoping			0	0	0										
Berwick Bank	1	EIAR	N/A	N/A	N/A	N/A	N/A	N/A									
Bowdun	2	Scoping				N/A	N/A	N/A	N/A								
Broadshore	2	Scoping			N/A	N/A	N/A	N/A									
Buchan	1	EIAR						N/A	N/A	N/A	N/A						
Caledonia	1	EIAR			3	3	3										
CampionWind	2	Scoping					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cenos	1	EIAR						N/A	N/A	N/A							
Havbredey	2	Scoping					0	0	0	0	0	0					
Machair Wind	2	Scoping	38	38	38	38	38										
MarramWind	2	Scoping			0	0	0	0	0	0	0	0	0				
Morven	2	Scoping	N/A	N/A	N/A	N/A	N/A	N/A	N/A								
Muir Mhòr	1	EIAR				N/A	N/A	N/A									
Ossian	1	EIAR						N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Scaraben	2	Scoping				N/A	N/A	N/A									
Seagreen 1A	1	Piling Strategy				N/A	N/A	N/A	-								
Sinclair	2	Scoping				N/A	N/A	N/A									
Stromar	2	Scoping			N/A	N/A	N/A	N/A									
Talisk	2	Scoping				0	0										

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West of Orkney	1	EIAR			90	90	90										
Total number			**38**	**38**	**131**	**131**	**133**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
% MU/SMU (57,417)			**0.066**	**0.066**	**0.228**	**0.228**	**0.232**	**0.003**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

13.13.3.6 No parameters for iPCoD modelling[7] exist for this species. In the absence of population modelling, and given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources, the future trajectory of the species is unknown. However, given the low proportion of the population predicted to be disturbed, population-level effects are considered highly unlikely.

Bottlenose dolphin (Coastal West Scotland and Hebrides Management Unit)

13.13.3.7 For the cumulative scenario for bottlenose dolphins in the CWSH MU, there were 2 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-52**.

Table 13-52 Number of bottlenose dolphin (CWSH MU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	**Tier**	**Source**	**Estimated no. disturbed animals per day, by year and project**					
			2026	**2027**	**2028**	**2029**	**2030**	**2031**
Spiorad na Mara	**N/A**	**EIAR**					**12**	**12**
Machair Wind	2	Scoping	1	1	1	1	1	
West of Orkney	1	EIAR			0	0	0	
Total number			**1**	**1**	**1**	**1**	**13**	**12**
% MU (45)			**2.222**	**2.222**	**2.222**	**2.222**	**28.889**	**26.667**

13.13.3.8 iPCoD modelling[7] was undertaken for the CWSH MU bottlenose dolphin population for the Offshore Project cumulatively with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for bottlenose dolphin in the CWSH MU used in the iPCoD modelling are presented in **Table 13-53**. **Table 13-54** shows that, by the end of 2049 (18 years after cumulative piling ends), the impacted population is predicted to be at 97.67% of the size of the un-impacted population, which means that disturbance has resulted in a 3.30% reduction in mean population size compared to pre-piling estimates.

Table 13-53 Number of bottlenose dolphin in the CWSH MU disturbed per piling day per project OWF development in the cumulative iPCoD simulation.

OWF development	**Piling years**	**Number of animals disturbed per day**
Spiorad na Mara	**2030-2031**	**12**
Machair Wind	2026-2030	1
West of Orkney	2028-2030	0

Table 13-54 Mean un-impacted and impacted population sizes for the CWSH MU for bottlenose dolphins in the cumulative iPCoD simulation.

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2026 (pre piling)	44	44	100.00%
End 2029 (after 4 years cumulative piling)	44	44	100.00%
End 2030 (end Offshore Project piling year 1)	44	43	97.73%
End 2031 (end Offshore Project piling year 2 & end of cumulative piling)	44	42	95.45%
End 2032 (1 year after cumulative piling ends)	44	42	95.45%
End 2037 (6 years after cumulative piling ends)	43	42	97.67%
End 2043 (12 years after cumulative piling ends)	43	42	97.67%
End 2049 (18 years after cumulative piling ends)	43	42	97.67%

Bottlenose dolphin (Oceanic Waters Management Unit)

13.13.3.9 For the cumulative scenario for bottlenose dolphins in the Oceanic Waters Management Unit (OW MU), there were 4 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-55**.

Table 13-55 Number of bottlenose dolphin (OW MU) potentially disturbed by cumulative underwater noise (piling years are indicated by yellow cells)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project									
			2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Spiorad na Mara	**N/A**	**EIAR**					**21**	**21**				
Havbredey	2	Scoping					5	5	5	5	5	5
Machair Wind	2	Scoping	2	2	2	2	2					
Talisk	2	Scoping				4	4					
West of Orkney	1	EIAR			0	0	0					
Total number			**2**	**2**	**2**	**6**	**32**	**26**	**5**	**5**	**5**	**5**

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project									
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
% MU (1,299)			0.154	0.154	0.154	0.462	2.463	2.002	0.385	0.385	0.385	0.385

13.13.3.10 iPCoD modelling[7] was undertaken for the OW MU bottlenose dolphin population for the Offshore Project cumulatively with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for bottlenose dolphin in the OW MU are presented in **Table 13-56**. **Table 13-57** shows that, by the end of 2047 (12 years after cumulative piling ends), the impacted population is predicted to be at 99.84% of the size of the un-impacted population, which means that disturbance has resulted in a 0.16% reduction in mean population size.

Table 13-56 Number of bottlenose dolphins in the OW MU disturbed per piling day per project in the cumulative iPCoD simulation

OWF development	Piling years	Number of animals disturbed per day
Spiorad na Mara	**2030-2031**	**21**
Havbredey	2030-2035	5 (OSP/RCS), 5 (WTG)
Machair Wind	2026-2030	2
Talisk	2029-2030	4 (OSP), 4 (WTG)
West of Orkney	2028-2030	0

Table 13-57 Mean un-impacted and impacted population sizes for the OW MU for bottlenose dolphins in the cumulative iPCoD simulation.

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2026 (pre piling)	1,298	1,298	100.00%
End 2029 (after 4 years cumulative piling)	1,295	1,295	100.00%
End 2030 (end Offshore Project piling year 1)	1,293	1,293	100.00%
End 2031 (end Offshore Project piling year 2)	1,290	1,288	99.84%
End 2035 (end of cumulative piling)	1,291	1,288	99.77%
End 2036 (1 year after cumulative piling ends)	1,292	1,289	99.77%
End 2041 (6 years after cumulative piling ends)	1,294	1,292	99.85%
End 2047 (12 years after cumulative piling ends)	1,286	1,284	99.84%

Risso's dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.13.3.11 For the cumulative scenario for Risso's dolphin in the CGNS MU, there were 23 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-58**.

Table 13-58 Number of Risso's dolphin potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells; N/A indicates receptor scoped out of the Other Development's CEA)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Spiorad na Mara	**N/A**	**EIAR**					798	798									
Arven	2	Scoping					0	0	0	0							
Aspen	1	EIAR			1,250	1,250	1,250										
Ayre	2	Scoping					27	27	27	27							
Bellrock	2	Scoping			N/A	N/A	N/A										
Berwick Bank	1	EIAR	N/A	N/A	N/A	N/A	N/A	N/A									
Bowdun	2	Scoping				N/A	N/A	N/A	N/A								
Broadshore	2	Scoping			0	0	0	0									
Buchan	1	EIAR						736	736	736	736						
Caledonia	1	EIAR			1	1	1										
CampionWind	2	Scoping					0	0	0	0	0	0	0	0	0	0	0
Cenos	1	EIAR						N/A	N/A	N/A							
Havbredey	2	Scoping					20	20	20	20	20	20					
Machair Wind	2	Scoping	2	2	2	2	2										
MarramWind	2	Scoping			0	0	0	0	0	0	0	0	0				
Morven	2	Scoping	N/A	N/A	N/A	N/A	N/A	N/A	N/A								
Muir Mhòr	1	EIAR				450	450	450									
Ossian	1	EIAR						N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Scaraben	2	Scoping				0	0	0									
Seagreen 1A	1	Piling Strategy				0	0	0	0								
Sinclair	2	Scoping				0	0	0									
Stromar	2	Scoping			27	27	27	27									
Talisk	2	Scoping				20	20										

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
West of Orkney	1	EIAR			121	121	121										
Total number			**2**	**2**	**1,401**	**1,871**	**2,716**	**2,058**	**783**	**783**	**756**	**20**	**0**	**0**	**0**	**0**	**0**
% MU/SMU (8,687)			**0.023**	**0.023**	**16.128**	**21.538**	**31.265**	**23.691**	**9.013**	**9.013**	**8.703**	**0.230**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

13.13.3.12 No parameters for iPCoD modelling[7] exist for this species. In the absence of population modelling and given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources, the future trajectory of the species is unknown. However, given the low proportion of the population predicted to be disturbed, population-level effects are considered highly unlikely.

Atlantic white-sided dolphin (Celtic and Greater North Seas Management Unit – UK portion)

13.13.3.13 For the cumulative scenario for Atlantic white-sided dolphin in the CGNS MU, there were 23 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-59**.

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Table 13-59 Number of Atlantic white-sided dolphin potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells; N/A indicates receptor scoped out of the Other Development's CEA)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Spiorad na Mara	**N/A**	**EIAR**					**97**	**97**									
Arven	2	Scoping					10	10	10	10							
Aspen	1	EIAR			178	178	178										
Ayre	2	Scoping					N/A	N/A	N/A	N/A							
Bellrock	2	Scoping			N/A	N/A	N/A										
Berwick Bank	1	EIAR	N/A	N/A	N/A	N/A	N/A	N/A									
Bowdun	2	Scoping				N/A	N/A	N/A	N/A								
Broadshore	2	Scoping			N/A	N/A	N/A	N/A									
Buchan	1	EIAR						130	130	130	130						
Caledonia	1	EIAR			N/A	N/A	N/A	N/A	N/A								
CampionWind	2	Scoping					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cenos	1	EIAR						N/A	N/A	N/A							
Havbredey	2	Scoping					N/A	N/A	N/A	N/A	N/A	N/A					
Machair Wind	2	Scoping	0	0	0	0	0										
MarramWind	2	Scoping			10	10	10	10	10	10	10	10	10				
Morven	2	Scoping	N/A	N/A	N/A	N/A	N/A	N/A	N/A								
Muir Mhòr	1	EIAR				N/A	N/A	N/A									
Ossian	1	EIAR						N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Scaraben	2	Scoping				N/A	N/A	N/A									
Seagreen 1A	1	Piling Strategy				N/A	N/A	N/A	-								
Sinclair	2	Scoping				N/A	N/A	N/A									
Stromar	2	Scoping			N/A	N/A	N/A	N/A									

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Talisk	2	Scoping				16	16										
West of Orkney	1	EIAR			N/A	N/A	N/A										
Total number			**0**	**0**	**188**	**204**	**311**	**247**	**150**	**150**	**140**	**10**	**10**	**0**	**0**	**0**	**0**
% MU/SMU (12,293)			**0.000**	**0.000**	**1.529**	**1.659**	**2.530**	**2.009**	**1.220**	**1.220**	**1.139**	**0.081**	**0.081**	**0.000**	**0.000**	**0.000**	**0.000**

13.13.3.14 No parameters for iPCoD modelling[7] exist for this species. In the absence of population modelling and given that marine mammal populations are hard to accurately predict due to the complex nature of marine ecosystems and changing uses of marine resources, the future trajectory of the species is unknown. However, given the low proportion of the population predicted to be disturbed, population-level effects are considered highly unlikely.

Long-finned pilot whale (no management unit)

13.13.3.15 The Project-alone scenario predicted that 202 pilot whales would be disturbed by piling noise. However, no pilot whales were detected during the Project's DAS campaign (**Appendix 13.1, Volume 2b**). As no management units exist for pilot whales and the UK population is unknown, a qualitative assessment of cumulative effects considered here. Pilot whales are found in their highest numbers in the deep waters to the north of Scotland/*Alba* and they are also often recorded off the west coast, despite the low activity recorded in the Project's PAM surveys (**Appendix 13.2, Volume 2b**). Given that the majority of Scottish wind farms are to be found on the east coast, it is therefore considered that the risk to pilot whales from cumulative effects of the Offshore Project with Other Developments is minimal.

Killer whale (no management unit)

13.13.3.16 Killer whales sighted off the west coast of Scotland/*Alba* are mostly frequently those within the West Coast Community, containing just 2 recently seen males but up to a possible 8 individuals, in a reducing population. As there is no management unit for killer whales and the use of density estimates from DAS produce ecologically unrealistic results of disturbed animals (as discussed in the Project-alone scenario (see Section 13.8.2)), a qualitative cumulative assessment for killer whales is considered appropriate.

13.13.3.17 Disturbance from piling noise from the Project alone on killer whales was considered as a minimal adverse effect. As a wide-ranging community, also known to spend time in waters off the coasts of Ireland, Wales, England and the east coast of Scotland/*Alba*, disturbance effects from piling of Other Developments may be experienced by these individuals. However, given the staggered programme of piling, it is considered that any effects on the population will be minimal as animals will be able to move away from areas disturbed by piling noise.

Beaked whale species (no management unit)

13.13.3.18 The Project-alone scenario predicted that 17 animals in the beaked whale species group would be disturbed by piling noise. However, no beaked whales were detected during the Project's DAS or PAM campaigns (**Appendix 13.1** and **Appendix 13.2, Volume 2b**). As no management units exist for beaked whales and the UK populations of each species are unknown, a qualitative assessment of cumulative effects is considered here. Beaked whales prefer deep, continental slope habitats and may use some features found around the Hebrides/*Na h-Eileanan Sia*. Given that the majority of Scottish wind farms are to be found on the east coast, it is therefore considered that the risk to beaked whales from cumulative effects of the Offshore Project with Other Developments is minimal.

Minke whale (Celtic and Greater North Seas Management Unit – UK portion)

13.13.3.19 For the cumulative scenario for minke whale in the CGNS MU, there were 23 OWFs that met the screening criteria for inclusive in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-60**.

Table 13-60 Number of minke whale (CGNS MU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Spiorad na Mara	**N/A**	**EIAR**					**65**	**65**									
Arven	2	Scoping					9	9	9	9							
Aspen	1	EIAR			1,368	1,368	1,368	1,368									
Ayre	2	Scoping					8	8	8	8							
Bellrock	2	Scoping			30	30	30										
Berwick Bank	1	EIAR	82	82	82	82	82	82									
Bowdun	2	Scoping				30	30	30	30								
Broadshore	2	Scoping			9	9	9	9									
Buchan	1	EIAR						443	443	443	443						
Caledonia	1	EIAR			502	502	502	502	502								
CampionWind	2	Scoping					30	30	30	30	30	30	30	30	30	30	30
Cenos	1	EIAR						384	384	384							
Havbredey	2	Scoping					16	16	16	16	16	16					
Machair Wind	2	Scoping	10	10	10	10	10										
MarramWind	2	Scoping			9	9	9	9	9	9	9	9	9				
Morven	2	Scoping	30	30	30	30	30	30	30								
Muir Mhòr	1	EIAR				777	777	777									
Ossian	1	EIAR						318	318	318	318	318	318	318	318		
Scaraben	2	Scoping				9	9	9									
Seagreen 1A	1	Piling Strategy				30	30	30	30								
Sinclair	2	Scoping				9	9	9									
Stromar	2	Scoping			8	8	8	8									
Talisk	2	Scoping				16	16										
West of Orkney	1	EIAR			77	77	77										

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project														
			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Total number			**122**	**122**	**2,125**	**2,996**	**3,124**	**4,136**	**1,801**	**1,209**	**816**	**373**	**357**	**348**	**348**	**30**	**30**
% MU/SMU (10,288)			**1.186**	**1.186**	**20.655**	**29.121**	**30.365**	**40.202**	**17.506**	**11.752**	**9.932**	**3.626**	**3.470**	**3.383**	**3.383**	**0.292**	**0.292**

13.13.3.20 iPCoD modelling[7] was undertaken for the CGNS MU minke whale UK population for this project cumulatively, with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for minke whale used in the iPCoD modelling are presented in **Table 13-61**. **Table 13-62** shows that, by the end of 2046 (6 years after cumulative piling ends), the impacted population is predicted to be at 99.81% of the size of the un-impacted population, which means that disturbance has resulted in a 0.19% reduction in mean population size.

Table 13-61 Number of minke whales in the CGNS MU disturbed per piling day per project OWF development in the cumulative iPCoD simulation.

OWF development	Piling years	Number of animals disturbed per day
Spiorad na Mara	**2030-2031**	**65**
Arven	2030-2033	9 (OSP), 9 (WTG)
Aspen	2028-2030	1,368 (WTG), 1,321 (OSP)
Ayre	2029-2033	8 (OSP), 8 (WTG)
Bellrock	2028-2030	30
Berwick Bank	2026-2031	82 (OSP), 82 (WTG)
Bowdun	2029-2032	30
Broadshore	2028-2031	9
Buchan	2028-2030	378 (WTG), 418 (OSP), 443 (ICR)
Caledonia	2028-2032	502 (fixed WTG), 415 (floating WTG)
CampionWind	2030-2040	30
Cenos	2029-2033	357 (WTG), 384 (OSP)
Havbredey	2030-2035	16 (OSP/RCS), 16 (WTG)
Machair Wind	2026-2030	10
MarramWind	2028-2036	9 (OSP/RCS), 9 (WTG)
Morven	2026-2032	30 (WTG), 30 (OSP)
Muir Mhòr	2029-2031	777 (OSP), 735 (WTG)
Ossian	2031-2038	318 (OSP), 168 (WTG)
Scaraben	2029-2031	9
Seagreen 1A	2029-2032	30
Sinclair	2029-2031	9
Stromar	2028-2031	8 (WTG), 8 (OSP)
Talisk	2029-2030	16 (OSP), 16 (WTG)
West of Orkney	2028-2030	77

Table 13-62 Mean un-impacted and impacted population sizes for the CGNS MU for minke whales in the cumulative iPCoD simulation.

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2026 (pre piling)	10,288	10,288	100%
End 2029 (after 4 years cumulative piling)	10,301	10,295	99.94%
End 2030 (end Offshore Project piling year 1)	10,295	10,274	99.80%
End 2031 (end Offshore Project piling year 2)	10,321	10,265	99.46%
End 2032 (1 year after Project piling ends)	10,309	10,243	99.36%
End 2040 (end cumulative piling)	10,275	10,261	99.86%
End 2041 (1 year after cumulative piling ends)	10,288	10,272	99.84%
End 2046 (6 years after cumulative piling ends)	10,319	10,299	99.81%

Humpback whale (no management unit)

13.13.3.21 As per the Project-alone assessment, the cumulative assessment of disturbance on humpback whales is a qualitative assessment. Humpback whales have no management unit within which to screen in Other Developments to the cumulative assessment, no density estimates exist and no parameters are available for iPCoD modelling.

13.13.3.22 The lack of data on abundance and distribution in the area is likely due to their low numbers. Given this fact and the seasonality of PAM data, identifying a pattern of higher singing activity between early February and mid-April (**Appendix 13.2, Volume 2b**), it is anticipated that any effect on humpback populations from disturbance will be minimal.

Fin whale (no management unit)

13.13.3.23 The Project-alone scenario predicted that 8 fin whales would be disturbed by piling noise. However, no fin whales were detected during the Project's DAS or PAM campaigns (**Appendix 13.1** and **Appendix 13.2, Volume 2b**). As no management units exist for fin whales and the UK population is unknown, a qualitative assessment of cumulative effects is considered here. Most records of fin whales in the region are to the east of Lewis and throughout the Minch. Given that the majority of Scottish wind farms are to be found on the east coast, it is therefore considered that the risk to fin whales from cumulative effects of the Offshore Project with Other Developments is minimal.

Grey seal (Western Isles Seal Monitoring Unit)

13.13.3.24 For the cumulative scenario for grey seals in the Western Isles Seal Monitoring Unit (WI SMU), there were 2 OWF that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-63**.

Table 13-63 Number of grey seal (WI SMU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project						
			2029	2030	2031	2032	2033	2034	2035
Spiorad na Mara	**N/A**	**EIAR**		**83**	**83**				
Havbredey	2	Scoping		35	35	35	35	35	35
Talisk	2	Scoping	18	18					
Total number			**18**	**136**	**118**	**35**	**35**	**35**	**35**
% MU (31,000)			**0.058**	**0.439**	**0.381**	**0.113**	**0.113**	**0.113**	**0.113**

13.13.3.25 iPCoD modelling[7] was undertaken for the WI SMU grey seal population for the Offshore Project cumulatively with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for grey seals used in the iPCoD modelling are presented in **Table 13-64**. **Table 13-65** shows that, by the end of 2053 (18 years after cumulative piling ends), the impacted population is predicted to be at 100% of the size of the un-impacted population, which means that disturbance has resulted in no change to mean population size.

Table 13-64 Number of grey seals in the WI SMU disturbed per piling day per OWF development in the cumulative iPCoD simulation.

OWF development	Piling years	Number of animals disturbed per day
Spiorad na Mara	**2030-2031**	**83**
Havbredey	2030-2035	35 (OSP/RCS), 35 (WTG)
Talisk	2029-2030	18 (OP), 18 (WTG)

Table 13-65 Mean un-impacted and impacted population sizes for the WI SMU for grey seals in the cumulative iPCoD simulation.

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2029 (pre piling)	30,998	30,998	100%
Start 2030 (after 1-year cumulative piling)	31,166	31,166	100%
End 2030 (end Offshore Project piling year 1)	31,358	31,358	100%

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
End 2031 (end Offshore Project piling year 2)	31,585	31,585	100%
End 2035 (end cumulative piling)	32,454	32,454	100%
End 2036 (1 year after cumulative piling ends)	32,659	32,659	100%
End 2041 (6 years after cumulative piling ends)	33,679	33,679	100%
End 2047 (12 years after cumulative piling ends)	34,918	34,918	100%
End 2053 (18 years after cumulative piling ends)	36,184	36,184	100%

Harbour seal (Western Isles Seal Monitoring Unit)

13.13.3.26 For the cumulative scenario for harbour seals in the Western Isles Seal Monitoring Unit (WI SMU), there were 2 OWFs that met the screening criteria for inclusion in the cumulative assessment. The numbers of cumulatively disturbed animals for the Offshore Project and Other Developments are presented in **Table 13-66**.

Table 13-66 Number of harbour seal (WI SMU) potentially disturbed by cumulative underwater noise (piling years are indicated in yellow cells)

Project	Tier	Source	Estimated no. disturbed animals per day, by year and project						
			2029	2030	2031	2032	2033	2034	2035
Spiorad na Mara	**N/A**	**EIAR**		**11**	**11**				
Havbredey	2	Scoping		1	1	1	1	1	1
Talisk	2	Scoping	1	1					
Total number			**1**	**13**	**13**	**1**	**1**	**1**	**1**
% MU (4,905)			**0.020**	**0.265**	**0.265**	**0.020**	**0.020**	**0.020**	**0.020**

13.13.3.27 iPCoD modelling[7] was undertaken for the WI SMU harbour seal population for the Offshore Project cumulatively with Other Developments (see **Appendix 13.4, Volume 2c**). The disturbance numbers for harbour seal used in the iPCoD modelling are presented in **Table 13-67**. **Table 13-68** shows that, by the end of 2053 (18 years after cumulative piling ends), the impacted population is predicted to be at 100% of the size of the un-impacted population, which means that disturbance has resulted in no change to mean population size.

Table 13-67 Number of harbour seals in the WI SMU disturbed per piling day per OWF development in the cumulative iPCoD simulation.

OWF development	Piling years	Number of animals disturbed per day
Spiorad na Mara	**2030-2031**	**11**
Havbredey	2030-2035	1 (OSP/RCS), 1 (WTG)
Talisk	2029-2030	1 (OP), 1 (WTG)

Table 13-68 Mean un-impacted and impacted population sizes for the WI SMU for harbour seals in the cumulative iPCoD simulation.

Year	Mean un-impacted population size	Mean impacted population size	Mean impacted population size as a proportion of the mean un-impacted population size
Start 2029 (pre piling)	4,902	4,902	100%
End 2029 (after 1 year cumulative piling)	4,906	4,906	100%
End 2030 (end Offshore Project piling year 1)	4,918	4,918	100%
End 2031 (end Offshore Project piling year 2)	4,926	4,926	100%
End 2035 (end cumulative piling)	4,936	4,936	100%
End 2036 (1 year after cumulative piling ends)	4,931	4,931	100%
End 2041 (6 years after cumulative piling ends)	4,945	4,945	100%
End 2047 (12 years after cumulative piling ends)	4,960	4,960	100%
End 2053 (18 years after cumulative piling ends)	4,967	4,967	100%

Summary

13.13.3.28 A summary of the magnitude of effects is given in **Table 13-69**. Magnitude of effect on marine mammal receptors from the assessment of disturbance from piling noise in the cumulative scenario is considered to be **Negligible** for all receptors, with the exception of bottlenose dolphin within the CWSH MU, and Risso's dolphin and white-beaked dolphin in the CGNS, which are considered to be **Low**. This is based on the guidelines for magnitude which state that a **Negligible** impact is defined as a transient recoverable effect on a few individuals, within the envelope of natural variability, no potential effect on the FCS and/or the long-term viability of the population, and very short-term effect and no changes to population size or future trajectory. A **Low** magnitude is defined by a low number of individuals being affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

13.13.3.29 Bottlenose dolphins within the CWSH MU, as shown within **Table 13-69**, have a higher % decrease in mean population size compared to other marine mammal receptors within other MUs, and therefore a higher magnitude of effect: **Low**. As a small population, almost a third of bottlenose dolphins in the CWSH MU are predicted to be disturbed by piling noise in both the Project-alone and cumulative scenarios, with the cumulative assessment adding an additional disturbed individual. Despite this, iPCoD modelling for the cumulative assessment predicts only a 3.30% reduction in mean population size, compared to pre-piling estimates. This is a larger effect than the 2.33% reduction of the Project-alone scenario, however, is still considered to be a small magnitude of effect on the population, especially when considering the in-built conservatism from the use of a harbour porpoise dose-response in the calculation.

13.13.3.30 Just over a third of Risso's dolphins are predicted to be disturbed in the cumulative scenario. The Project-alone assessment was highly conservative due to the use of uniform density estimates. The cumulative assessment is further influenced by high numbers of disturbed Risso's dolphins at the Aspen and Buchan wind farms. Given that Risso's dolphin has the largest MU, extending over the entirety of UK waters (CGNS), disturbed animals from wind farms off the east coast of Scotland are part of the cumulative assessment, adding further conservatism. It is therefore considered that population-level effects on Risso's dolphin from the cumulative assessment are highly unlikely.

13.13.3.31 Despite a low number of white-beaked dolphins and minke whales being disturbed by the Project alone, the cumulative scenario adds to more than half of the UK population of white-beaked dolphin being disturbed by piling in the year 2030 and to 40% of the UK population of minke whale being disturbed by piling in the year 2031. These two receptors are assessed within the CGNS MU, which is an expansive management unit, covering all UK waters. Therefore, similarly to Risso's dolphin, there is a high degree of conservatism in the cumulative assessment. Parameters exist for minke whale to be modelled with iPCoD and this has demonstrated that, despite the high proportion of disturbed animals, a less than 1% change in mean population size is predicted. This is considered to be a **Negligible** result in terms of magnitude of effect. Without parameters for iPCoD for white-beaked dolphins, a qualitative assessment of population effects is required. The highest numbers of disturbed white-beaked dolphins were predicted for three wind farms off the east coast of Scotland (Muir Mhòr, Aspen and Caledonia). It is considered overly precautionary to expect cumulative population-level effects on this receptor, as it is unlikely that all Other Developments would be piling at the same time as the Offshore Project. White-beaked dolphin is conservatively assessed as being of **Low** magnitude of effect.

Table 13-69 Summary of the cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise (* denotes a highly precautionary estimate from Project-alone assessment, in the absence of fine-scale surface densities)

Species	MU/SMU	Cumulative no. disturbed animals (highest year)/ qualitative	% of MU disturbed	Mean impacted population size as a proportion of the mean un-impacted population size at the end of cumulative piling	% change in mean population size	Magnitude of effect
Harbour porpoise	WS	2,471 (2030)	10.2	99.49%	0.06%	Negligible
White-beaked dolphin	CGNS	18,305 (2030)	53.7	-	Minimal	Low
Common dolphin	CGNS	133 (2030)	0.2	-	Minimal	Negligible
Bottlenose dolphin	CWSH	13 (2030)	28.9	97.67%	3.30%	Low
Bottlenose dolphin	OW	32 (2030)	2.5	99.84%	0.16%	Negligible
Risso's dolphin	CGNS	2,716* (2030)	31.3	-	Minimal	Low
Atlantic white-sided dolphin	CGNS	311* (2030)	2.5	-	Minimal	Negligible
Long-finned pilot whale	None	Minimal	-	-	Minimal	Negligible
Killer whale	None	Minimal	-	-	Minimal	Negligible
Beaked whale species	None	Minimal	-	-	Minimal	Negligible
Minke whale	CGNS	4,136 (2031)	40.2	99.81%	0.19%	Negligible
Humpback whale	None	Minimal	-	-	Minimal	Negligible
Fin whale	None	Minimal	-	-	Minimal	Negligible
Grey seal	WI	136 (2030)	0.4	100%	0%	Negligible
Harbour seal	WI	13 (2030/31)	2.7	100%	0%	Negligible

Sensitivity or value of receptor

13.13.3.32 The sensitivity and value of receptors for the cumulative assessment are unchanged from the Project-alone assessment and are discussed in Section 13.8.2. In summary, the sensitivity of all marine mammal receptors is considered to be **Low**. This is based on the guidelines for sensitivity which states that a receptor has the ability to recover, adapt and/or tolerate an impact, and therefore a change in survival and/or reproductive rate (e.g. vital rates) is unlikely.

Significance of effect

13.13.3.33 The above appraisal of cumulative effects from piling noise considered there to be a **Negligible** to **Low** magnitude of effect upon receptors of **Low** sensitivity. As such, the significance of effect for all marine mammal receptors is **Negligible**, apart from bottlenose dolphins in the CWSH MU and Risso's dolphins and white-beaked dolphins in the CGNS MU, for which the significance is **Minor**, indicating no significant effects on any receptor. A **Negligible** cumulative effect indicates that there is no detectable change in the environment or receptor and there are no significant cumulative effects on marine mammal receptors. A cumulative effect of 'minor' indicates a detectable but small-scale change to the environment or receptor with no significant cumulative effects on marine mammal receptors.

North-east Lewis MPA

13.13.3.34 The Project-alone assessment of disturbance from piling noise on the North-east Lewis MPA concluded that the Project's construction phase was capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

13.13.3.35 The three closest Other Developments to the Offshore Project are Talisk, Havbredey and West of Orkney, and it is considered unlikely that any wind farms beside these would produce noise contours extending across the boundary of the North-east Lewis MPA. 959 Risso's dolphins were predicted to be disturbed by these three Other Developments cumulatively with the Offshore Project. However, it might be assumed that there would only be a small area of overlap of noise contours of each Project with the MPA boundary, meaning that a number far lower than this would be predicted to be disturbed whilst in the MPA on any given day in 2030. Furthermore, the assessment assumes that these projects will all be piling simultaneously, which is highly unlikely.

13.13.3.36 It is therefore considered that cumulative disturbance from piling is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

Sea of the Hebrides MPA

13.13.3.37 Given the position of the Sea of the Hebrides MPA some 80 km to the south of the Array Area, there is a distance of approximately 40 km between the MPA boundary and the predicted extent of piling noise. Without an overlap of the noise contours from the Offshore Project, there is no potential for piling noise, in the Project-alone scenario or cumulatively with Other Developments, of affecting the protected feature (minke whale) of Sea of the Hebrides MPA nor any supporting feature upon which minke whale is dependent, either directly or indirectly.

13.13.4 CUMULATIVE DISTURBANCE FROM TURBINE NOISE

Magnitude

Harbour porpoise (West Scotland Management Unit)

13.13.4.1 For the cumulative assessment for disturbance from turbine noise for harbour porpoises in the WS MU, there were 4 OWFs which were scoped into the cumulative assessment. Projects which are predicted to have operation phases coinciding with this Project include Havbredey, Machair Wind, Talisk and West of Orkney.

13.13.4.2 Operational noise from turbines is primarily low frequency, and with relatively poor hearing sensitivity at low frequencies, harbour porpoises are likely to be able to detect operational turbines but population-level effects are not expected (Thomsen *et al.,* 2006; Marmo *et al.,* 2013). Supporting research carried out which modelled the noise effects of operational turbines suggests that harbour porpoises were not predicted to exhibit a behavioural response to sounds generated under any of the modelled operational wind turbine scenarios (Marmo *et al.*, 2013). Sound levels in this study were lower than those required to elicit a behavioural response from harbour porpoise, and therefore on an individual OWF basis, no effects were observed.

White-beaked dolphin, common dolphin, Risso's dolphin, Atlantic white-sided dolphin, minke whale (Celtic and Greater North Seas Management Unit – UK portion), and long-finned pilot whale, killer whale and beaked whale species (have not been assigned management units)

13.13.4.3 For the cumulative assessment for disturbance from turbine noise for cetaceans within the CGNS MU, there were 24 OWFs which were scoped into the cumulative assessment, i.e. the full list of Other Developments given in **Table 13-70**.

13.13.4.4 The number of animals which may be affected by the cumulative effects of disturbance from turbine noise during the O&M phase is likely to be negligible, despite species within the CGNS MU belonging to different hearing groups.

13.13.4.5 Operational noise from turbines is primarily low frequency, and with relatively poor hearing sensitivity at low frequencies, high-frequency cetaceans are likely to be able to detect operational turbines but vital rates are not expected to be impacted (Thomsen *et al.*, 2006; Marmo *et al.*, 2013). Supporting research carried out which modelled the noise effects of operational turbines suggests that bottlenose dolphins were not predicted to exhibit a behavioural response to sounds generated under any of the modelled operational wind turbine scenarios (Marmo *et al.*, 2013). Given that bottlenose dolphins were the only delphinid in this study, and belong to the same HF hearing group as white-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins, long-finned pilot whales, killer whales and beaked whale species (see **Table 13-9**), it is predicted that these species would respond in a similar way. Sound levels in this study were lower than those required to elicit a behavioural response from bottlenose dolphins, and therefore on an individual OWF basis, no effects were observed.

13.13.4.6 Minke whales as LF cetaceans are the most sensitive marine mammal receptor to low frequency noise and were determined to be more sensitive to wind turbine noise compared to other species in the study (Marmo *et al*., 2013). Despite their higher sensitivity to low frequencies, a low number of minke whales are anticipated to be disturbed or displaced by the Offshore Project's O&M phase.

Bottlenose dolphin (Coastal West Scotland and Hebrides Management Unit)

13.13.4.7 For the cumulative assessment for disturbance from turbine noise for bottlenose dolphins within the CWSH MU, there were 2 OWFs which were scoped into the cumulative assessment. Projects which are predicted to have operation phases coinciding with the Project include Machair Wind and West of Orkney.

13.13.4.8 The number of animals which may be affected by the cumulative disturbance from turbine noise during the O&M phase is likely to be negligible. Operational noise from turbines is primarily low frequency, and with relatively poor hearing sensitivity at low frequencies, bottlenose dolphins are likely to be able to detect operational turbines, but population-level effects are not expected (Thomsen *et al.,* 2006; Marmo *et al.,* 2013). Supporting research carried out which modelled the noise effects of operational turbines suggests that bottlenose dolphins were not predicted to exhibit a behavioural response to sounds generated under any of the modelled operational wind turbine scenarios (Marmo *et al.,* 2013). Sound levels in this study were lower than those required to elicit a behavioural response from bottlenose dolphins, and therefore on an individual OWF basis, no effects were observed.

Bottlenose dolphin (Oceanic Waters Management Unit)

13.13.4.9 For the cumulative assessment for disturbance from turbine noise for bottlenose dolphins within the OW MU, there were 4 OWFs which were scoped into the cumulative assessment. Projects which are predicted to have operation phases coinciding with the Project include Havbredey, Machair Wind, Talisk and West of Orkney.

13.13.4.10 As noted within paragraph 13.13.4.8, the number of individual animals which may be affected by the cumulative effects of disturbance from turbine noise during the O&M phase is likely to be negligible.

Grey seal and harbour seal (Western Isles Seal Monitoring Unit)

13.13.4.11 For the cumulative assessment for disturbance from turbine noise for grey and harbour seals within the Western Isles Seal Monitoring Unit (WI SMU), there were 2 OWFs which were scoped into the cumulative assessment. Projects which are predicted to have operation phases coinciding with the Project include Havbredey and Talisk.

13.13.4.12 The number of animals which may be affected by the cumulative effects of disturbance from turbine noise during the O&M phase is likely to be negligible. Both seal species have a lesser hearing sensitivity to low-frequency noise compared to minke whale, however, can detect wind farms for similar distances in a range of weather conditions (Marmo *et al*., 2013).

13.13.4.13 Operational noise from turbines is primarily low frequency, and with hearing relatively poor hearing sensitivity at low frequencies, bottlenose dolphins are likely to be able to detect operational turbines but vital rates are not expected to be impacted (Thomsen *et al.*, 2006; Marmo *et al.*, 2013). Supporting research carried out which modelled the noise effects of operational turbines suggests that neither seal species were predicted to exhibit a behavioural response to sounds generated under any of the modelled operational wind turbine scenarios (Marmo *et al.*, 2013). Sound levels in this study were lower than those required to elicit a behavioural response from grey and harbour seals, and therefore on an individual OWF basis, no effects were observed.

Summary

13.13.4.14 A summary of the magnitude of effects is given in **Table 13-69**. Magnitude of effects on marine mammal receptors from the assessment of disturbance from turbine noise during the operational phase is considered to be **Low** for all marine mammal receptors. This is based on the guidelines for magnitude which state that a low number of individuals will be affected, representing a small shift from baseline conditions. Effects are unlikely to be of a scale or duration which will affect FCS and/or the long-term viability of the population.

Sensitivity or value of receptor

13.13.4.15 The sensitivity and value of receptors for the cumulative assessment are unchanged from the Project-alone assessment and are discussed in Section 13.9.1. In summary, the sensitivity is **Low** for VHF and LF cetaceans and **Negligible** for HF cetaceans and phocid carnivores in water. This is based on the guidelines for sensitivity which state that a receptor is able to recover, adapt or tolerate an impact, and survival and/or reproductive rates (e.g. vital rates) are not affected.

Significance of effect

13.13.4.16 The above appraisal of cumulative effects from disturbance from operational turbine noise considered there to be a **Low** magnitude of effect upon receptors of **Negligible** or **Low** sensitivity. As such, the significance of effect for all marine mammal receptors is **Negligible**. A cumulative effect of 'negligible' indicates that there is no detectable change in the environment or receptor and there are no significant cumulative effects on marine mammal receptors.

North-east Lewis MPA

13.13.4.17 Disturbance from operational turbine noise in the Project-alone scenario was assessed as being capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA, but insignificantly.

13.13.4.18 Taking the most precautionary distance estimate of 18.84 km from monopile foundations (Marmo *et al.*, 2013) for operational turbine noise at high wind speeds (e.g. 10-15 m/s), only Talisk and Havbredey wind farms, in addition to the Offshore Project, have the potential to produce operational turbine noise audible to Risso's dolphins within the MPA. Furthermore, this would only be expected in a small northern segment of the MPA.

13.13.4.19 It is therefore considered that cumulative disturbance from operational turbine noise is capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.

Sea of the Hebrides MPA

13.13.4.20 At a distance of more than 80 km to the south of the Array Area, it is considered that operational wind turbine noise is not capable of affecting the protected feature (minke whale) of Sea of the Hebrides MPA or its prey species in terms of disturbance, either in the Project-alone scenario or cumulatively with Other Developments, either directly or indirectly.

13.13.5 SUMMARY OF CUMULATIVE EFFECTS

13.13.5.1 A description of the significance of cumulative effects upon marine mammal receptors arising from each identified impact is given below. Where available, a quantitative assessment has been carried out using information publicly accessible within the planning application documents for the Other Developments, alongside iPCoD modelling results for specific species for the Offshore Project. It is noted that the maximum assessment assumptions quoted within these planning applications (EIARs) are often refined during the determination period and in the post-consent phase such that the final scheme's build-out may have a reduced impact when compared to what has previously been assessed.

13.13.5.2 The summary of the CEA for Marine Mammals and accompanying mitigation measures are set out in **Table 13-70**.

Table 13-70 Cumulative effects assessment for Marine Mammals

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
1	Talisk Offshore Wind Farm	OWF-024	Piling of Talisk Offshore Wind Farm is planned for 2029-2030, with operation anticipated from 2032 until decommissioning in 2077. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is also potential for cumulative effects with the Project for the following species and MUs/SMUs, and MPAs: • Harbour porpoises within the Western Scotland MU; • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU); • Bottlenose dolphins within the Oceanic Waters MU; • Grey and harbour seals within the Western Isles SMU. The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. Cumulative effects of disturbance from piling noise are considered capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise is considered to be **Negligible** (**not significant**) for all receptors. Cumulative effects of disturbance from operational turbine noise are considered capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
2	Havbredey Offshore Wind Farm	OWF-026	Piling of Havbredey Offshore Wind Farm is planned for 2030-2035, with operation anticipated from 2035 until decommissioning in 2060. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is also potential for cumulative effects with the Project for the following species and MUs/SMUs, and MPAs: • Harbour porpoises within the Western Scotland MU; • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU); • Bottlenose dolphins within the Oceanic Waters MU;	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			• Grey and harbour seals within the Western Isles SMU. The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. Cumulative effects of disturbance from piling noise are considered capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors. Cumulative effects of disturbance from operational turbine noise are considered capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly.	
3	West of Orkney Offshore Wind Farm	OWF-027	Piling of West of Orkney Offshore Wind Farm is planned for 2028 and 2030 with operation anticipated from 2029 until decommissioning in 2059. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs, and MPAs: • Harbour porpoises within the Western Scotland MU; • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU); • Bottlenose dolphins within the Coastal West Scotland and Hebrides and Oceanic Waters MUs. The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, with the exception of bottlenose dolphins within the CWSH MU and Risso's dolphins and white-beaked dolphins, which were assessed to be **Minor**, which is **Not Significant**. Cumulative effects of disturbance from piling noise are considered capable of affecting the protected feature (Risso's dolphin) of North-east Lewis MPA in terms of disturbance, but insignificantly. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** for all receptors, with the exception of bottlenose dolphins within the CWSH MU, which was assessed to be **Low**, both of which are **Not Significant**.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
4	Caledonia Offshore Wind Farm	OWF-028	Piling of Caledonia Offshore Wind Farm is planned for 2028-2032 with operation anticipated from 2030 until decommissioning in 2065. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise;	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			• Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
5	Machair Wind Offshore Wind Farm	OWF-021	Piling of Machair Offshore Wind Farm is planned for 2026-2030 and has potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • Harbour porpoises within the Western Scotland MU; • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU); • Bottlenose dolphins within the Coastal West Scotland and Hebrides and Oceanic Waters MUs. The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, with the exception of bottlenose dolphins within the CWSH MU and Risso's dolphins, which were assessed to be **Minor**, both of which are **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
6	Ayre Offshore Wind Farm	OWF-023	Piling of Ayre Offshore Wind Farm is planned for 2029-2033, with operation anticipated from 2034 to decommissioning in 2069. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU).	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, with the exception of bottlenose dolphins within the CWSH MU and Risso's dolphins and white-beaked dolphins, which were assessed to be **Minor**, which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	and/or best practice standards and guidance and adhered to.
7	Stromar Offshore Wind Farm	OWF-017	Piling of Stromar Offshore Wind Farm is planned for 2028-2033, with operation anticipated from 2037 until decommissioning in 2062. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
8	Broadshore Offshore Wind Farm	OWF-018	Piling of Broadshore Offshore Wind Farm is planned for 2028-2031, with operation anticipated from 2034 until decommissioning in 2059. There is and has potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
9	Sinclair Offshore Wind Farm	OWF-034	Piling of Sinclair Offshore Wind Farm is planned for 2029-2031, with operation anticipated from 2034 until decommissioning in 2059. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to
10	Scaraben Offshore Wind Farm	OWF-035	Piling of Scaraben Offshore Wind Farm is planned for 2029-2031, with operation anticipated from 2034 until decommissioning in 2059. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
11	Buchan Offshore Wind Farm	OWF-016	Piling of Buchan Offshore Wind Farm is planned for 2028-2030, with operation anticipated from 2034 until decommissioning in 2069. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs:	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			• White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
12	MarramWind Offshore Wind Farm	OWF-020	Piling of Marram Offshore Wind Farm is planned for 2028-2036, with operation anticipated from 2036. No decommissioning dates are currently available for this Project, however operation will not exceed the lease agreement which concludes in 2080. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
13	Seagreen 1A Offshore Wind Farm	OWF-046	Piling of Seagreen 1A Offshore Wind Farm is planned for 2029-2030, with operation anticipated from 2031 until decommissioning in 2056. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU).	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	
14	Bowdun Offshore Wind Farm	OWF-014	Piling of Bowdun Offshore Wind Farm is planned for 2029-2032, with operation anticipated from 2034 until decommissioning in 2069. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
15	Muir Mhor Offshore Wind Farm	OWF-025	Piling of Muir Mhor Offshore Wind Farm is planned for 2029-2031, with operation anticipated from 2034 until decommissioning in 2079. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
16	Berwick Bank Offshore Wind Farm	OWF-009	Piling of Berwick Bank Offshore Wind Farm is planned for 2026-2031, with operation anticipated from 2033 until decommissioning in 2068. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
17	Morven Offshore Wind Farm	OWF-032	Piling of Morven Offshore Wind Farm is planned for 2026-2032, with operation anticipated from 2035 until decommissioning in 2060. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to
18	Aspen Offshore Wind Farm	OWF-043	Piling of Aspen Offshore Wind Farm is planned for 2028-2030, with operation anticipated from 2031 until decommissioning in 2066. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs:	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			• White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
19	Ossian Offshore Wind Farm	OWF-015	Piling of Ossian Offshore Wind Farm is planned for 2031-2038, with operation anticipated from 2038 until decommissioning in 2073. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
20	CampionWind Offshore Wind Farm	OWF-022	Piling of CampionWind Offshore Wind Farm is planned for 2030-2040, with operation anticipated from 2040 until decommissioning in 3000. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	
21	Arven South Offshore Wind Farm	OWF-030	Piling of Arven South Offshore Wind Farm is planned for 2030-2033, with operation anticipated from 2034 until decommissioning in 2059. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
22	Arven Offshore Wind Farm	OWF-033	Piling of Arven Offshore Wind Farm is planned for 2030-2033, with operation anticipated from 2035 until decommissioning in 2059. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
23	Bellrock Offshore Wind Farm	OWF-019	Piling of Cenos Offshore Wind Farm is planned for 2029-2033, with operation anticipated from 2032 until decommissioning in 2057. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise;	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements

ID (Figure 13.28, Volume 2b)	Development title	Application reference	Assessment summary	Mitigation
			• Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.
24	Cenos Offshore Wind Farm	OWF-040	Piling of Cenos Offshore Wind Farm is planned for 2031-2038, with operation anticipated from 2035 until decommissioning in 2070. There is potential for cumulative effects with the Project for the following impact pathways: • Cumulative disturbance from piling noise; • Cumulative disturbance from turbine noise; There is potential for cumulative effects with the Project for the following species and MUs/SMUs: • White-beaked dolphins, common dolphins, Risso's dolphins, Atlantic white-sided dolphins and minke whales within the Celtic and Greater North Seas MU; • Long-finned pilot whales, killer whales and beaked whale species (no MU). The cumulative effects on marine mammal receptors from the assessment of disturbance from piling noise are considered to be **Negligible** for all receptors, apart from Risso's dolphins and white-beaked dolphins (**Minor**), which is **Not Significant**. The cumulative effects on marine mammal receptors from the assessment of disturbance from operational turbine noise are considered to be **Negligible** (**Not Significant**) for all receptors.	M003: A MMMP will be developed prior to commencement of construction (building on the **Outline MMMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to. M019: A final OEMP will be developed prior to commencement of construction (building on **Outline OEMP, Volume 3**) in compliance with legislative requirements and/or best practice standards and guidance and adhered to.

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13.14 TRANSBOUNDARY EFFECTS

13.14.1.1 Transboundary effects occur when a development in one European Economic Area (EEA) State impacts the environment of another EEA State(s). A screening of potential transboundary effects was undertaken within the Scoping Report (Spiorad na Mara Limited, 2023).

13.14.1.2 As per consultation with NatureScot from the Scoping Opinion, detailed in **Table 13-3**, it was advised that transboundary effects on marine mammals and other megafauna were scoped out of further assessment. Therefore, no assessment on transboundary effects is included in this chapter.

13.15 SUMMARY OF RESIDUAL EFFECTS

13.15.1.1 **Table 13-71** presents a summary of the assessment of significant impacts, any relevant mitigation measures, and residual effects on marine mammal receptors.

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Table 13-71 Summary of residual effects

Activity and impact	Receptor	Magnitude of impact	Receptor and sensitivity or value	Embedded mitigation measures	Significance of effect (significance)	Further environmental mitigation	Significance of residual effect (significance)
Construction							
Auditory injury from piling noise	All Marine Mammal receptors	Negligible	Medium	M019 and M003	Negligible (Not significant)	N/A	N/A
Disturbance from piling noise	Risso's dolphin and Bottlenose dolphin (within CWSH MU)	Low	Low	M019 and M003	Negligible (Not significant)	N/A	N/A
	All other Marine Mammal receptors	Negligible	Low	M019 and M003	Negligible (Not significant)	N/A	N/A
Auditory injury from other construction noise	All Marine Mammal receptors	Negligible	Medium	M019 and M003	Negligible (Not significant)	N/A	N/A
Disturbance from other construction noise	All Marine Mammal receptors	Negligible	Low	M019 and M003	Negligible (Not significant)	N/A	N/A
Vessel collision	Beaked whale species, Minke whale, Humpback whale and Fin whale	Low	Medium	M029 and M015	Minor (not significant)	N/A	N/A
	All other Marine Mammal receptors	Low	Low	M029 and M015	Negligible (Not significant)	N/A	N/A
Disturbance or temporary habitat loss	All Marine Mammal receptors	Low	Low	M021, M029 and M015	Negligible (Not significant)	N/A	N/A

Activity and impact	Receptor	Magnitude of impact	Receptor and sensitivity or value	Embedded mitigation measures	Significance of effect (significance)	Further environmental mitigation	Significance of residual effect (significance)
from presence of vessels							
Accidental release of pollutants	All Marine Mammal receptors	Low	High	M019, M031, M004, M005, M021	Minor (Not significant)	N/A	N/A
Increases in suspended sediment concentration and reduction in water quality	All Marine Mammal receptors	Negligible	Negligible	M031, M005	Negligible (Not significant)	N/A	N/A
Indirect effects of impacts on prey availability	All Marine Mammal receptors	Low	Low	M002, M019, M031, M005	Negligible (Not significant)	N/A	N/A
Operation and maintenance							
Disturbance from turbine noise	Harbour Porpoise, Minke whale, Humpback whale and Fin whale	Low	Low	None	Negligible (Not significant)	N/A	N/A
	Killer whale	Low	Negligible	None	Negligible (Not significant)	N/A	N/A
	All other marine mammal receptors	Low	Negligible	None	Negligible (Not significant)	N/A	N/A
Disturbance from other operational noise	All marine mammal receptors	Negligible	Low	M025	Negligible (Not significant)	N/A	N/A

Activity and impact	Receptor	Magnitude of impact	Receptor and sensitivity or value	Embedded mitigation measures	Significance of effect (significance)	Further environmental mitigation	Significance of residual effect (significance)
Vessel collision	Beaked whale species, Minke whale, Humpback whale and Fin whale	Low	Medium	M029 and M015	Minor (Not significant)	N/A	N/A
	All other marine mammal receptors	Low	Low	M029 and M015	Negligible (Not significant)	N/A	N/A
Barrier effects	Harbour porpoise, White-beaked dolphin, Common dolphin, Bottlenose dolphin, Risso's dolphin, Atlantic white-sided dolphin, Long-finned pilot whale and Killer whale	Low	Low	None	Negligible (Not significant)	N/A	N/A
	All other marine mammal receptors	Low	Low	None	Negligible (Not significant)	N/A	N/A
Long-term changes in habitat and foraging opportunities	All marine mammal receptors	Low	Low	M002, M025, M031, M005	Negligible (Not significant)	N/A	N/A
Accidental release of pollutants	All marine mammal receptors	Low	High	M025, M004, M005, M021, M031	Minor (Not significant)	N/A	N/A

Activity and impact	Receptor	Magnitude of impact	Receptor and sensitivity or value	Embedded mitigation measures	Significance of effect (significance)	Further environmental mitigation	Significance of residual effect (significance)
Increases in suspended sediment concentration and reduction in water quality	All marine mammal receptors	Negligible	Negligible	M031, M005	Negligible (Not significant)	N/A	N/A
Indirect effects of impacts on prey availability	All marine mammal receptors	Low	Low	M002, M025, M031, M005	Negligible (Not significant)	N/A	N/A
Decommissioning							
See impacts to construction above.							

13.16 GLOSSARY OF TERMS AND ABBREVIATIONS

13.16.1.1 A list of key terms and acronyms used in this chapter are provided in **Table 13-72** and **Table 13-73**.

Table 13-72 Acronyms and abbreviations

Term	Definition
%	Percent
ADD	Acoustic Deterrent Devices
ARU	Acoustic Recording Unit
ASCOBANS	Agreement on Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
BDMLR	British Divers Marine Life Rescue
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
CEF	Cumulative Effects Framework
CGNS	Celtic and Greater North Seas
CI	Confidence Interval
CIEEM	Chartered Institute for Ecology and Environmental Management
CMS	The Convention on the Conservation of Migratory Species of Wild Animals
CnES	Comhairle nan Eilean Siar
CODA	Cetacean Offshore Distribution and Abundance in the European Atlantic
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CV	Coefficient of Variation
CWSH	Coastal West Scotland and the Hebrides
DAS	Digital Aerial Survey
dB	Decibel
EDR	Effective deterrence range
EMF	Electromagnetic Field
EEC	European Economic Community
EU	European Union
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
FCS	Favourable Conservation Status
GES	Good Environmental Status
GSD	Ground Sampling Distance
GT	Gross Tonnes
HAB	Harmful algal bloom

Term	Definition
HF	High-frequency
HPAI	Highly Pathogenic Avian Influenza
HRA	Habitats Regulations Appraisal
HWDT	Hebridean Whale and Dolphin Trust
IAMMWG	Inter-Agency Marine Mammal Working Group
IEF	Important Ecological Features
IMMA	Important Marine Mammal Areas
IMO	International Maritime Organisation
iPCoD	Interim Population Consequences of Disturbance
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometre
LF	Low-frequency
m	Metre
MAGIC	Multi-agency Geographic Information for the Countryside
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate – Licensing Operations Team
MD-SEDD	Marine Directorate – Science, Evidence, Data and Digital
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Management Plan
MMO	Marine Mammal Observer
MSFD	Marine Strategy Framework Directive
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MU	Management Unit
NEA	North-East Atlantic
nm	Nautical Mile
NMFS	National Marine and Fisheries Service
NMP	National Marine Plan
NSVMP	Navigational Safety and Vessel Management Plan
O&M	Operation and Maintenance
OEMP	Outline Offshore Environmental Management Plan
ONS	Onshore Substation
OSP	Offshore Substation Platform
OSPAR	The Convention for the Protection of the Marine Environment of the North East Atlantic
OTW	Onshore Transmission Works
OWF	Offshore Wind Farm
PAC	Preliminary Application Consultation
PAM	Passive Acoustic Monitoring
PCW	Phocid carnivores in water
PDV	Phocine Distemper Virus
PMF	Priority Marine Feature

Term	Definition
PPM	Porpoise Positive Minutes
PTS	Permanent Threshold Shift
QA	Quality assurance
RCS	Reactive Compensation Station(s)
ReCON	Reducing Conservatism in Underwater Noise in Assessment for Offshore Wind
RIAA	Report to inform Appropriate Assessment
RMS	Root mean square
SAC	Special Area of Conservation
SCOS	Special Committee on Seals
SEL	Sound exposure level
SEL_{cum}	Cumulative Sound Exposure Level
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea
SMRU	Sea Mammal Research Unit
SMASS	Scottish Marine Animal Stranding Scheme
SMU	Seal Monitoring Unit
SMWWC	Scottish Marine Wildlife Watching Code
SNH	Scottish Natural Heritage (Now Known as NatureScot)
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSC	Suspended Sediment Concentration
TTS	Temporary Threshold Shift
UK	United Kingdom
US	United States
UXO	Unexploded Ordnance
VHF	Very-high-frequency
VLF	Very-low-frequency
VMP	Vessel Management Plan
WDC	Whale and Dolphin Conservation
WI SMU	Western Isles Seal Monitoring Unit
WS	West Scotland
WTG	Wind Turbine Generator
WTIV	Wind turbine installation vessel
ZOI	Zone of Influence

Table 13-73 Glossary

Term	Meaning
The Applicant	Spiorad na Mara Limited (the Project owner)
Annex IV (of the Habitats Directive)	Part of the Habitats Directive 92/43/EEC that requires member states to establish strict protection for listed species, including all cetaceans. All forms of deliberate capture or killing, deliberate disturbance, deterioration or destruction of breeding or resting sites, use of all indiscriminate means of capture or killing capable of causing local disappearance and serious disturbance to populations of such species, and the keeping, transport and sale of specimens taken from the wild, are prohibited under Annex IV.
Annex II Species	Animal or plant species of community interest, defined in Annex II of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (Habitats Directive). The designation of Special Areas of Conservation (SAC) is required in the UK to ensure the conservation of these species. The protection afforded to sites designated prior to EU Exit persists in UK law.
Array Area	The offshore area within which the offshore wind turbine generators (WTGs), associated foundations, Offshore Cables, and Offshore Substation Platform (OSP) (if required), will be located. This area encompasses the Turbine Area that will contain all above water surface infrastructure (WTGs / OSP) and an additional area within which further below water infrastructure (foundations and cables) may also be located.
Array Cables	The offshore electrical and communication cables that connect infrastructure located within the Array Area, for: • Scenario 1: Array Cables will used to connect Wind Turbine Generators (WTGs) to each other, and to connect WTGs to the OSP. • Scenario 2: Array Cables will used to connect WTGs to each other.
Cetacean	A group of marine mammals that includes all whales, dolphins and porpoises.
Convolutional Neural Network	A deep learning algorithm for object recognition and classification.
Decibels (dB)	Unit of measurement to measure the intensity of a sound or the power level of an electrical signal by comparing to a given level of logarithmic scale.
Delphinid	A marine dolphin (Family: Delphinidae)
Diel	Denoting a period of 24 hours.
Digital Aerial Survey (DAS)	Digital surveys carried out by aeroplane.
Electromagnetic field (EMF)	An electric and magnetic force field that surrounds a moving electrical charge.

Term	Meaning
Embedded or 'Designed-in' Mitigation	Mitigation measures to avoid or reduce environmental effects that are directly incorporated into the preferred design for the Project. This can include standard practice in accordance with or without guidance. Embedded Mitigation is considered as part of the impact assessment, before effect significance is identified.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Impact Assessment Report (EIAR)	The Environmental Impact Assessment Report (EIAR) prepared to assess the likely significant effects of the Project on the environment.
Export Cable	The offshore electrical and communication cables located in the Array Area and Offshore Cables Area of Search that connect the Offshore Substation Platform (OSP) (if required) to Landfall for Scenario 1.
Horizontal Directional Drilling (HDD)	A trenchless crossing engineering technique using a drill steered underground without the requirement for open trenches. This method is able to carry out the underground installation of pipes and cables with minimal surface disruption.
Horizontal Directional Drill (HDD) Exit Pit	Represents one exit pit that will be located within the Landfall Exit Pit Area.
Impact	Change that is caused by an action; for example, foundation installation (action) during construction which results in habitat loss (impact).
Impact pathway	The EIA for the Offshore Project utilises the 'source-pathway-receptor' model to identify relevant receptors, where applicable. This model highlights potential impacts of the Offshore Project on environmental receptors, establishing a clear link between impact sources and receptor. The impact pathway is the route through which the potential impacts (as a result of an effect of an activity) could reach a receptor.
Jack-up vessel	A jack-up vessel is a barge with legs that can be raised and lowered to install offshore wind farm components and foundations.
Likely Significant Effects	With respect to the Electricity Works (EIA (Scotland) Regulations 2017 and The Marine Works (EIA) Regulations 2017, a significant effect that may reasonably be predicted as a consequence of a plan or project, on the receiving environment.
Marine Mammal	A specialised group of mammals, which have adapted to life in the oceans and seas (and some rivers).
Marine Protected Area (MPA)	Marine sites defined at the national level under the Marine (Scotland) Act 2010. In Scotland/*Alba*, MPAs are areas of sea defined so as to protect habitats, wildlife, geology, undersea landforms, historic shipwrecks and to demonstrate sustainable management of the sea.

Term	Meaning
Maximum Design Scenario	The scenario within the Project Design Envelope with the potential to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor. See **Chapter 3: Project Description, Volume 1a** for detailed description.
Mitigation	Term used to indicate avoidance, remediation or alleviation of adverse impacts.
Mysticete	A baleen whale. Baleen whales use plates of baleen to filter their food from the water, rather than having teeth.
Odontocete	A toothed whale. A large group of cetaceans, comprising dolphins, porpoises and whales without baleen plates.
Offshore	Pertaining to seaward of Mean High Water Springs (MHWS).
Offshore Application	The application for a marine licence under the Marine (Scotland) Act 2010 (between 0 and 12nm) and a Section 36 consent under the Electricity Act 1989.
Offshore Cables	Electrical and communication cables located within the Array Area and Offshore Cable Area of Search. The Offshore Cables consist of Array Cables, Array Cables to Landfall, and Export Cables.
Offshore Cable Area of Search (OCAS)	The area within which the offshore cable infrastructure between the Array Area and Landfall up to Mean High Water Springs (MHWS) will be located.
Offshore Project	The offshore components of the Spiorad na Mara offshore wind farm (the Project) located seaward of Mean High Water Springs (MHWS).
Offshore Project Boundary	The 'red line boundary' encompassing the Offshore Project.
Offshore Substation Platform (OSP)	The optional offshore substation located within the Turbine Area. Includes the platform and associated components which allows the voltage to be increased to meet onward transmission requirements.
Offshore Wind Farm (OWF)	A group of WTGs located offshore.
Onshore	Pertaining to landward of MLWS.
Onshore Transmission Works (OTW) / Onshore Project	The onshore components of the Spiorad na Mara offshore wind farm (the Project) located landward of Mean Low Water Springs (MLWS). The Applicant will seek consent for the OTW Project through a separate application and so does not form part of this application.
Onshore Transmission Works Boundary / Onshore Project Boundary	The 'red line boundary' encompassing all temporary and permanent works associated with the OTW/Onshore Project.
Passive Acoustic Monitoring (PAM)	The use of recorders fitted with hydrophones (in water) or microphones (in air) to 'listen' for sounds emitted by marine mammals or other sources.
Permanent Threshold Shift (PTS)	Permanent hearing damage; auditory injury.
Pinniped	A group of carnivorous mammals, comprising the seals and their relatives.

Term	Meaning
Porpoise Positive Minute (PPM)	A minute in which a porpoise is detected in PAM. Used to quantify activity levels.
Project	The Spiorad na Mara offshore wind farm development. This term describes the whole development, including all offshore and onshore components.
Project Boundary	The 'red line boundary' encompassing all offshore and onshore components of the Project.
Receptor	Any physical, biological or anthropogenic element of the environment that may be affected or impacted by the Project. Receptors can include natural features such as the seabed and wildlife habitats as well as man-made features like fishing vessels and cultural heritage sites.
Scoping Opinion	A report presenting the written opinion of the Scottish Ministers, with input from Comhairle nan Eilean Siar (CnES) for the OTW, as to the scope and level of detail of information to be provided in the Environmental Impact Assessment (EIA) for the Project.
Scoping Report	A document submitted by a developer that outlines the potential environmental issues and effects of a proposed project to determine which topics, methods, and level of detail should be included in the full Environmental Impact Assessment (EIA).
Scour protection	The protection of sediment against localised erosion e.g. by placing rock.
Sediment dispersion	The dilution and settling of sediment as it travels from a source.
Sediment disturbance	Disturbing/displacing sediment (contaminated or uncontaminated).
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value associated to that receptor.
Significance	A measure of the importance of the environmental effect, defined by criteria specific to the environmental aspect.
Significant effect	It is a requirement of the EIA Regulations 2017 to determine the likely significant effects of the development on the environment, which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated. The significance of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and the sensitivity of the receptor) that should be attached to the impact described. Whether or not an effect should be considered significant is not absolute and requires the application of professional judgement. Significant – 'noteworthy, of considerable amount or effect or importance, not insignificant or negligible' (The Concise Oxford Dictionary).

Term	Meaning
	Those levels and types of landscape and visual effect likely to have a major or important / noteworthy or special effect of which a decision maker should take particular note.
Sound Exposure Level (SEL or $L_{E,p}$)	The constant sound level acting for 1 second, which has the same amount of acoustic energy, as indicated by the square of the sound pressure, as the original sound. It is the time-integrated, sound-pressure-squared level. SEL is typically used to compare transient sound events having different time durations, pressure levels, and temporal characteristics.
Sound Exposure Level, cumulative (SEL_{cum} or $L_{E,p,t}$)	Single value for the collected, combined total of sound exposure over a specified time or multiple instances of a noise source.
Sound Exposure Level, single strike (SEL_{ss})	Calculation of the sound exposure level representative of a single noise impulse, typically a pile strike.
Sound Pressure Level (SPL or L_p)	The sound pressure level is an expression of sound pressure using the decibel (dB) scale; the standard frequency pressures of which are 1 μPa for water and 20 μPa for air.
Special Area of Conservation	An area designated under the EC Habitats Directive to ensure that rare, endangered or vulnerable habitats or species of community interest are either maintained at or restored to a favourable conservation status.
Study Area	The area within which a given survey was undertaken in order to obtain baseline information.
Suspended sediment concentration	The mass concentration (mass/volume) of sediment in suspension.
Temporary Threshold Shift (TTS)	Reversible and temporary hearing loss.
Transboundary effects	Assessment of changes to the environment caused by the combined effect of past, present and future human activities and natural processes on other European Economic Area Member States.
Turbine Area	A reduced area within the Array Area where above water surface infrastructure would be located i.e. wind turbine generators (WTG) or Offshore Substation Platform (OSP) (if required). This area has been developed and refined through stakeholder consultation and environmental assessment.
Wind Turbine Generator (WTG)	The wind turbines that generate electricity consisting of tubular towers and blades attached to a nacelle housing mechanical and electrical generating equipment.
Ziphiid	A beaked whale species (Family: Ziphiidae).

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