Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 6: Environmental Statement

Volume 2, Chapter 11: Marine mammals (tracked changes)

Date: June 2024

Revision C

Document Reference: 6.2.11
Pursuant to: APFP Regulation 5 (2) (a)
Ecodoc number: 004866033-03

Document revisions

Revision	Date	Status/reason for issue	Author	Checked by	Approved by
A	04/08/2023	Final for DCO Application	GoBe	RED	RED
B	28/02/2024	Deadline 1	GoBe	RED	RED
C	03/06/2024	Deadline 4	GoBe	RED	RED

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Executive Summary

This chapter of the Rampion 2 Environmental Statement (ES) examines the likely significant effects that may be experienced as a result of Rampion 2 with respect to marine mammals.

A desk-based review of literature and existing datasets has been undertaken (**Appendix 11.1: Marine mammal baseline technical report, Volume 4** (Document Reference: 6.4.11.1) to establish the marine mammal baseline at the time of writing. This included relevant previous marine mammal records and surveys in the area, including the results of Rampion 1 site specific surveys and details of the consultation with Expert Topic Groups (ETG). The characterisation of the baseline environment has been supported by site-specific marine mammal surveys from the study area collected from April 2019 to March 2021. The survey area for the marine mammal assessment included the proposed DCO Order Limits plus a 4km buffer.

Existing data identified the highest densities in the area were recorded for harbour porpoise and common dolphins. Lower densities of bottlenose dolphins and minke whales were recorded suggesting the area is not of high importance for these species. Grey seal and harbour seals have also been identified within the baseline.

The assessment focuses on the construction, operation, and decommissioning phases of Rampion 2, as at the Scoping stage of the Environmental Impact Assessment (EIA) it was agreed that there are likely to be impacts from activities associated with these phases on marine mammal receptors. During the construction phase, underwater noise impacts have been assessed, including the risk of Permanent Threshold Shift (PTS) and disturbance from piling.

A range of environmental measures are embedded as part of the Rampion 2 design to remove or reduce any significant environmental effects on marine mammal receptors, as far as possible.

Further mitigation measures are included in order to avoid significant adverse effects on marine mammals and reduce the residual effect significance to not significant in terms of EIA. For underwater noise impacts, mitigation options under consideration include installation equipment choice and secondary noise abatement options. These ensure a noise reduction is achievable which reduces impact ranges with sensitive receptors and designated areas. This has been covered in the draft mitigation plans for piling and unexploded ordnance (UXO) clearance that accompany this chapter. It will also be included in the final mitigation plans in the post-consent phase that will be produced prior to the commencement of piling or UXO clearance, and again be considered in the decommissioning mitigation plan. Moreover, for vessel disturbance and collision risk, mitigation includes the implementation of a Vessel Management Plan (VMP).

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11. Marine mammals

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents the results of the assessment of the likely significant effects of Rampion 2 with respect to marine mammals, including underwater noise. It should be read in conjunction with the project description provided in **Chapter 4: The Proposed Development** and the relevant parts of the following chapters and appendices:

- **Chapter 1: Introduction, Volume 2** of the ES (Document Reference: 6.2.1);
- **Chapter 2: Policy and legislative context, Volume 2** of the ES (Document Reference: 6.2.2);
- **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5);
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) (due to the shared habitat of species, relevance of impacts to mammal prey species and similarity in potential impacts);
- **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) (due to the intersections of habitats at mean high water springs (MHWS));
- **Chapter 12: Offshore and intertidal ornithology, Volume 2** of the ES (Document Reference: 6.2.12) (due to the presence of bird species that use both intertidal and terrestrial habitats).
- **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1);
- **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2);
- **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3);
- **Draft piling marine mammal mitigation protocol** (Document Reference: 7.14)**;**
- **Draft Unexploded Ordnance (UXO) clearance marine mammal mitigation protocol (MMMP)** (Document Reference: 7.15)**;** and
- **Report to inform appropriate assessment** (Document Reference: 5.9).

11.1.2 This technical chapter describes:

- the legislation, planning policy and other documentation that has informed the assessment (**Section 11.2: Relevant legislation, planning policy, and other documentation**);

- the outcome of consultation and engagement that has been undertaken to date, including how matters relating to marine mammals within the Statutory Consultation, have been addressed (**Section 11.3: Consultation and engagement**);
- the scope of the assessment for marine mammals (**Section 11.4: Scope of the assessment**);
- the methods used for the baseline data gathering (**Section 11.5: Methodology for baseline data gathering**);
- the overall baseline (**Section 11.6: Baseline conditions**);
- embedded environmental measures relevant to marine mammals and the relevant maximum design scenario (**Section 11.7: Basis for ES assessment**);
- the assessment methods used for the ES (**Section 11.8: Methodology for ES assessment**);
- the assessment of marine mammals effects (**Section 11.9- 11.11: Assessment of effects** and **Section 11.12: Assessment of cumulative effects**);
- consideration of transboundary effects (**Section 11.13: Transboundary effects**);
- inter-related effects (**Section 11.14: Inter-related effects**);
- a summary of residual effects for marine mammals (**Section 11.15: Summary of residual effects**);
- a glossary of terms and abbreviations is provided in **Section 11.16: Glossary of terms and abbreviations**; and
- a references list is provided in **Section 11.17: References**.

11.2 Relevant legislation, planning policy and other documentation

Introduction

11.2.1 This section identifies the legislation, policy and other documentation that has informed the assessment of effects with respect to marine mammals. Further information on policies relevant to the EIA and their status is provided in **Chapter 2: Policy and legislative context, Volume 2** of the ES (Document Reference: 6.2.2) of this ES.

Legislation and national planning policy

11.2.2 **Table 11-1** lists the legislation relevant to the assessment of the effects on marine mammal receptors.

Table 11-1 Legislation relevant to marine mammals

Legislation description	Relevance to assessment
The Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (referred to as The Habitats Regulations)	
All cetaceans in Northern European waters are listed under Annex IV of the EU Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive) as European Protected Species (EPS) of Community Interest and in need of strict protection. Pinnipeds in Northern European waters are listed under Annex V of the EU Directive 92/43/EEC on the Habitats Directive for which it must be ensured that exploitation and taking in the wild is compatible with them maintaining a favourable conservation status. The harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) also have protection under Annex II as species of Community Interest whose conservation requires the designation of Special Areas of Conservation (SACs). The Habitats Directive is transposed into UK law through the Conservation of Habitats and Species Regulations 2017 (as amended in 2019) which implements the Habitats Directives in territorial waters out to 12 nautical miles (nm). The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended in 2019) transpose the provisions of the Habitats Directive in offshore waters, beyond 12 nm. Together the sets of regulations are referred to as “the Habitats Regulations”. The Habitats Regulations provide protection for designated sites, known as the national site network (formerly Natura 2000 sites) which include SACs and Special Protection Areas (SPAs). Ramsar sites are included as a matter of government policy.	The Habitats Regulations make it an offence to kill, injure or disturb any EPS. An incidence of disturbance will be considered an offence if the disturbance is likely to have an ecologically significant adverse effect on a significant number of animals (note: for the purpose of simplification, in this guidance, references to ‘adversely affect(ed)’ should be taken to mean ‘significantly affect the ability to survive, breed, or rear or nurture their young’). The second element is that the disturbance must be likely to significantly affect the local distribution or abundance of the species. A disturbance offence will be committed if either of these elements occurred. The risk of any injury, disturbance or death to an EPS is addressed in the **Draft Piling MMMP** (Document Reference: 7.14) and the **Draft UXO Clearance MMMP** (Document Reference: 7.15). The Proposed Development will have potential effects on marine mammal species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section 11.4**) and the embedded environmental measures detailed in **Section 11.7.** The Proposed Development does not directly overlap with any SAC designated for marine mammals, however, a number of SACs for marine mammals are within the same management units (MU) for these species as the Proposed Development. Full consideration of the potential for an impact on these SACs is

Legislation description	Relevance to assessment
	given within the Screening Report (RED, 2020).
EU Directive 2008/56/EC – Marine Strategy Framework Directive	
The Marine Strategy Framework Directive (MSFD) provides a legislative framework for an ecosystem-based approach to the management of activities which supports the sustainable use of marine goods and services. The aim of the Directive is to achieve 'Good Environmental Status' by 2020 across Europe's marine environment. Annex I of the MSFD includes the following requirements that are relevant to marine mammals: Biological diversity is maintained; • The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic, and climatic conditions; • All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity; • Concentrations of contaminants are at levels not giving rise to pollution effects; and • Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.	The Proposed Development will have potential effects on the marine environment, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section 11.4**) and the environmental measures embedded within the Proposed Development are detailed in **Section 11.7**
Bonn Convention	
The Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) requires signatories to conserve migratory species and their habitats by providing strict protection for endangered migratory species (Appendix I of the Convention) and lists migratory	There are 44 cetacean species and 6 pinniped species listed under Appendix I of the Bonn Convention. The UK ratified the Convention in 1985. The legal requirement for the strict protection of Appendix I species is provided by the Wildlife and Countryside Act (1981 as amended).

Legislation description	Relevance to assessment
species which will benefit from multilateral Agreements for conservation and management (Appendix II).	The Proposed Development may have potential effects on marine mammal species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section 11.4**) and the environmental measures embedded within the Proposed Development are detailed in **Section 11.7**.
Bern Convention	
The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) aims to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention.	There are 30 species of cetacean listed under Annex II of the Bern Convention (strictly protected fauna), including harbour porpoise, bottlenose dolphins, common dolphins, Risso's dolphins, white-beaked dolphins and minke whales. All other cetacean species as well as both grey and harbour seals are listed under Annex III of the Bern Convention (protected fauna). The obligations of the Convention are transposed into national law by means of the Wildlife and Countryside Act (1981 as amended). The Proposed Development may have potential effects on these species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section 11.4)** and the embedded environmental measures detailed in **Section 11.7**.
Wildlife and Countryside Act 1981 (as amended)	
The Wildlife and Countryside Act consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats ('the Bern Convention'), the Convention on the Conservation of Migratory Species of Wild Animals ('the	The Proposed Development may have potential effects on marine mammal species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section**

Legislation description	Relevance to assessment
Bonn Convention') the conservation of wild birds (Birds Directive). The act makes it an offence to intentionally (or recklessly) kill, injure or take any wild animal listed on Schedule 5 of the Act, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. Additionally, the act makes it an offence to intentionally or recklessly disturb any wild animal listed on Schedule 5. All cetacean species are protected within the 12 nm territorial waters under Schedule 5 of the Wildlife and Countryside Act.	**11.4**) and the embedded environmental measures detailed in **Section 11.7**.
Conservation of Seals Act, 1970	
Both grey and harbour seal species are protected under the Conservation of Seals Act (1970) and as of changes that came into force in 2021 it makes it an offence to intentionally or recklessly kill, injure or take seals. Following the Phocine Distemper Virus (PDV) outbreak in 1999, an Order was issued under the Conservation of Seals Act providing year- round protection to both grey and harbour seals on the east and south-east coast of England, from Berwick to Newhaven (under the Conservation of Seals (England) Order 1999).	The Proposed Development may have potential effects on seal species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section 11.4**) and the embedded environmental measures detailed in **Section 11.7**.
UK Biodiversity Action Plan and the UK Post-2010 Biodiversity Framework (2012)	
The UK Biodiversity Action Plan (BAP) identifies biological resources in the UK and plans for their conservation. This was succeeded by the UK Post-2010 Biodiversity Framework in 2012 in response to the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011-2020 (published in 2010) and the EU Biodiversity Strategy (published in 2011). The UK Post-2010 Biodiversity Framework describes how the UK can meet the Aichi Biodiversity Targets. The UK BAP	UK BAP priority species include the cetacean species present in UK waters and harbour seals. This list of priority species is still used to inform statutory lists of priority species in the UK. The Proposed Development will have potential effects on marine mammal species, particularly during the construction phase. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see **Section**

Legislation description	Relevance to assessment
identified priority species that are the most threatened and require conservation.	**11.4**) and the embedded environmental measures detailed in **Section 11.7**.

11.2.3 **Table 11-2** lists the national planning policy relevant to the assessment of the effects on marine mammal receptors.

Table 11-2 National planning policy relevant to marine mammals (National Policy Statements, 2011)

Policy description	Relevance to assessment
The Overarching National Policy Statement (NPS) for Energy (EN-1) (July 2011)	
Paragraph 5.3.3 states that 'Applicants should ensure that the Environmental Statement clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity"	The potential effects of the construction, operation, and decommissioning phases of the Proposed Development on marine mammals have been assessed in the impact assessment (**Sections 11.9** to **11.12**). The assessment of impacts on SACs and Ramsars that have marine mammals as protected features is detailed in the HRA screening report (RED, 2020).
The Overarching National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (July 2011)	
Paragraph 2.6.64 states that '*Applicants should assess the effects on the offshore ecology and biodiversity for all stages of the lifespan of the proposed offshore wind farm*'.	The potential effects of the construction, operation and decommissioning phases of the Proposed Development have been assessed in the impact assessment (**Sections 11.9** to **11.12**).
Paragraph 2.6.65 states that '*Consultation on the assessment methodologies should be undertaken at early stages with the statutory consultees as appropriate*'.	Consultation with relevant statutory and non-statutory stakeholders has been carried out and is described in **Section 11.3**.
Paragraph 2.6.66 states that '*Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational offshore wind farms should be referred to where Appropriate*'.	Data on marine mammal usage of existing operational offshore wind farms has been used to inform the sensitivity assessment for operation phase impacts.
Paragraph 2.6.67 states that '*Applicants should assess the potential for the scheme to have both positive and negative effects on marine ecology and biodiversity*'.	Both the adverse and beneficial effects of the Proposed Development have been assessed (**Sections 11.9** to **11.12**).

Policy description	Relevance to assessment
Paragraph 2.6.68 states '*The Secretary of State should consider the effects of a proposal on marine ecology and biodiversity taking into account all relevant information made available to it*'.	The potential effects of the construction, operation and decommissioning phases of the Proposed Development have been assessed in the impact assessment (**Sections 11.9** to **11.12**).
Paragraph 2.6.69 states '*The designation of an area as a Natura 2000 site does not necessarily restrict the construction or operation of offshore wind farms in or near that area*'.	The HRA Screening Report (RED, 2020) identified that there was no connectivity between the Proposed Development and any Natura 2000 sites (UK sites now within the National Site Network, NSN) for marine mammals.
Paragraph 2.6.70 states '*Mitigation may be possible in the form of careful design of the development itself and the construction techniques employed*'.	This was considered when defining the ramp up/ soft start procedure[1] [2] for piling. In addition, both a piling and UXO MMMP approved by the Marine Management Organisation (MMO) in consultation with Natural England will be implemented during construction, the details of which will be agreed once the final Proposed Development Design is known. A **Draft Piling MMMP** (Document Reference: 7.14) and **Draft UXO Clearance MMMP** (Document Reference: 7.15) have been submitted with this Application.
Paragraph 2.6.71 states '*Ecological monitoring is likely to be appropriate during the construction and operational phases to identify the actual impact so that, where appropriate, adverse effects can then be mitigated and to enable further useful information to be published relevant to future projects*.'	If deemed necessary, monitoring will be carried out in order to validate the predictions of the impact assessment (as required). The need for and details of any such monitoring will be agreed through consultation with the Statutory Nature Conservation Bodies (SNCBs) and presented in a marine mammal monitoring plan.
Paragraph 2.6.90 states '*Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and*	The impacts from piling noise are assessed within **Section 11.1.** Where mitigation measures are required, these

[1] Monopile maximum design scenario: hammer capacity increased by 20% increments until reaching 100% and full capacity piling, this results in increase monopile blow energy from 880 kJ at 20% to 4,400 kJ at 100%

[2] Pin-pile maximum design scenario: hammer capacity increased by 20% increments until reaching 100% and full capacity piling, this results in increase monopile blow energy from 500 kJ at 20% to 2,500 kJ at 100%

Policy description	Relevance to assessment
paragraphs 2.6.58 to 2.6.71 above sets out offshore wind-specific biodiversity policy. In addition, there are specific considerations from piling noise which apply to offshore wind energy infrastructure proposals with regard to marine mammals, including cetaceans and seals, which have statutory protection'.	have been identified within (**Table 11-14** and **Section 11.9** to **11.11**).
Paragraph 2.6.91 states '*Offshore piling may reach noise levels which are high enough to cause injury, or even death, to marine mammals. If piling associated with an offshore wind farm is likely to lead to the commission of an offence (which would include deliberately disturbing, killing or capturing a European Protected Species), an application may have to be made for a wildlife licence to allow the activity to take place*.'	A draft EPS licence has been submitted alongside this document as part of the application. Prior to any piling activity being undertaken for the Proposed Development, an EPS licence will be applied for.
Paragraph 2.6.92 states '*Where necessary the assessment of the effects on marine mammals should include details of: likely feeding areas; known birthing areas/haul out sites; nursery grounds; known migration or commuting routes; duration of potentially disturbing activity including cumulative/in-combination effects; baseline noise levels (*Appendix 11.3*); predicted noise levels in relation to mortality, Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS); soft-start noise levels; and operational noise*'.	All of the specified marine mammal ecology details are included in this chapter. Construction and operational noise impacts and their likely effects on marine mammal behaviour and ecology have been assessed (**Sections 11.9** to **11.11**). This assessment also considers the cumulative impacts of the Proposed Development and other relevant plans or projects (**Section 11.12**).
Paragraph 2.6.93 states '*The Applicant should discuss any proposed piling activities with the relevant body. Where assessment shows that noise from offshore piling may reach noise levels likely to lead to an offence, the Applicant should look at possible alternatives or appropriate mitigation before applying for an EPS licence*'	Potential mitigation methods are considered within the **Draft Piling MMMP** (Document Reference: 7.14) with the aim to reduce the risk of PTS to negligible levels. The details of the Final piling MMMP will be approved by the MMO in consultation with Natural England ahead of the construction phase. A **Draft Piling MMMP** (Document Reference: 7.14) has been submitted with this Application.
Paragraph 2.6.94 states '*The Secretary of State should be satisfied that the preferred*	The Proposed Development has considered different foundation options,

Policy description	Relevance to assessment
methods of construction, in particular for foundations and the foundation type are designed to reasonably minimise significant disturbance effects. The Secretary of State may refuse the application if suitable noise mitigation measures cannot be imposed by requirements to any development consent'.	hammer energies and ramp-ups. A piling MMMP will be developed and approved by the MMO in consultation with Natural England prior to the commencement of construction which will detail the appropriate mitigation measures based on the finalised Proposed Development design. A **Draft Piling MMMP** (Document Reference: 7.14) has been submitted with this Application.
Paragraph 2.6.95 states '*The conservation status of marine European Protected Species, and seals, are of relevance to the Secretary of State. The Secretary of State should take into account the views of the relevant statutory advisors*'.	The conservation status of EPS and seals are considered within the impact assessment (**Sections 11.9** to **11.12**).
Paragraphs 2.6.97 to 2.6.99 state *'Mitigation: monitoring of a mitigation area for marine mammals surrounding the piling works prior to commencement of, and during, piling activities. During construction, 24 hour working practices may be employed to reduce the total construction programme and the potential for impacts. Soft-start procedures during pile driving may be implemented to avoid significant adverse impacts*'	A piling MMMP, approved by the MMO in consultation with Natural England, will be implemented during construction. The MMMP will include mitigation measures with the aim to reduce the risk of PTS to marine mammals. A **Draft Piling MMMP** (Document Reference: 7.14) has been submitted with this Application. Monitoring of marine mammals has been detailed within the **Offshore In Principle Offshore Monitoring Plan** (Document Reference: 7.18).
Marine Policy Statement (HM Government, 2011)	
The Marine Policy Statement is the framework for preparing Marine Plans and taking decisions affecting the marine environment. The high-level objective "Living within environmental limits" includes the following requirements relevant to marine mammals: • Biodiversity is protected, conserved and, where appropriate, recovered, and loss has been halted; • Healthy marine and coastal habitats occur across their natural range and are able to support strong, biodiverse	The potential effects of the construction, operation, and decommissioning phases of the Proposed Development on marine mammals have been assessed in the impact assessment (**Sections 11.9** to **11.12**).

Policy description	Relevance to assessment
biological communities and the functioning of healthy, resilient and adaptable marine ecosystems; and • Our oceans support viable populations of representative, rare, vulnerable, and valued species.	

11.2.4 **Table 11-3** lists the emerging national planning policy considerations relevant to the assessment of the effects on marine mammal receptors.

Table 11-3 Emerging National planning policy relevant to marine mammals (National Policy Statements, 2023)

Policy description	Relevance to assessment
Emerging National Policy Statement for Renewable Energy Infrastructure (EN-3), March 2023	
Paragraph 3.8.139 states "*Construction activities, including installing wind turbine foundations by pile driving, geophysical surveys, and clearing the site and cable route of unexploded ordinance (UXOs) may reach noise levels which are high enough to cause disturbance, injury, or even death to marine mammals*."	A European Protected Species (EPS) wildlife licence is always required for piling and UXO clearance and an application will be made prior to start of construction.
Paragraph 3.8.140 states "*All marine mammals are protected under Part 3 of the Habitats Regulations.*"	
Paragraph 3.8.141 states "*If construction and associated noise levels are likely to lead to an offence under Part 3 of the Habitats Regulations (which would include deliberately disturbing, injuring or killing), applicants will need to apply for a wildlife licence to allow the activity to take place.*"	
Paragraph 3.8.142 states *"The development of offshore wind farms can also impact fish species (see paragraphs 2.8.129 – 2.8.133), which can have indirect impacts on marine mammals if those fish are prey species*."	The potential impacts to prey availability from construction are assessed in **Section 11.9**.

Policy description	Relevance to assessment
Paragraph 3.8.143 states "*There is also the risk of collision with construction and maintenance vessels and potential entanglement risks from floating wind structures.*"	The potential impact of collision risk from construction and operation vessels is assessed in **Sections 11.9** and **11.10**. There are no floating elements of the Project (see **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)) so there is no risk of entanglement of marine mammals with floating structures.
Paragraph 3.8.144 states *"Where necessary, assessment of the effects on marine mammals should include details of:* *• likely feeding areas and impacts on prey species and prey habitat;* *• known birthing areas / haul out sites for breeding and pupping;* *• migration routes;* *• protected sites;* *• baseline noise levels;* *• predicted construction and soft start noise levels in relation to mortality, permanent threshold shift (PTS), temporary threshold shift (TTS) and disturbance;* *• operational noise;* *• duration and spatial extent of the impacting activities including cumulative/in-combination effects with other plans or projects;* *• collision risk;* *• entanglement risk; and* *• barrier risk*"	The ES has considered the effects from all development stages on marine mammals. These assessments are provided in **Sections 11.9 to 11.12**.
Paragraph 3.8.145 states "*The scope, effort and methods required for marine mammal surveys should be discussed with the relevant SNCB.*"	The scope, effort and methods for the marine mammal surveys were discussed throughout the Evidence Plan Process (see **Evidence Plan** (Document Reference: 7.21)).
Paragraph 3.8.146 states "T*he applicant should discuss any proposed noisy activities with the relevant body and must reference the joint JNCC and SNCB underwater noise guidance in relation to noisy activities (alone and in-combination with other plans or projects) within HRA sites, in addition to the JNCC mitigation*	The impacts of the Proposed Development on designated sites are assessed in the **RIAA** (Document Reference: 5.9). The mitigation measures for underwater noise are specified in **Table 11-14** and further detail can be found in the A **Draft Piling MMMP** (Document Reference: 7.14) and **Draft**

Policy description	Relevance to assessment
guidelines to piling, explosive use, and geophysical surveys."	**UXO Clearance MMMP** (Document Reference: 7.15).
Paragraph 3.8.147 states "*Where the assessment identifies that noise from construction and UXO clearance may reach noise levels likely to lead to noise thresholds being exceeded (as detailed in the JNCC guidance) or an offence as described in paragraph 2.8.138 above, the applicant will be expected to look at possible alternatives or appropriate mitigation (detailed below)*"	The mitigation measures for underwater noise are specified in **Table 11-14** and further detail can be found in the A **Draft Piling MMMP** (Document Reference: 7.14) and **Draft UXO Clearance MMMP** (Document Reference: 7.15).
Paragraph 3.8.148 states "*The applicant should develop a Site Integrity Plan (SIP) to allow the cumulative impacts of underwater noise to be reviewed closer to the construction date, when there is more certainty in other plans and projects*."	A SIP is not required as the closest site is >26 km from
Paragraph 3.8.254 states "*Monitoring of the surrounding area before and during the piling procedure can be undertaken by various methods including marine mammal observers and passive acoustic monitoring. Active displacement of marine mammals outside potential injury zones can be undertaken using equipment such as acoustic deterrent devices. Soft start procedures during pile driving may be implemented. This enables marine mammals in the area disturbed by the sound levels to move away from the piling before physical or auditory injury is caused*"	The details of marine mammal monitoring and mitigation is presented within the A **Draft Piling MMMP** (Document Reference: 7.14) and **Draft UXO Clearance MMMP** (Document Reference: 7.15). See **Table 11-2** and **Table 11-14** for more information. Monitoring of marine mammals has been detailed within the **Offshore In Principle Offshore Monitoring Plan** (Document Reference: 7.18).
Paragraph 3.8.255 states "*Where noise impacts cannot be avoided, other mitigation should be considered, including alternative installation methods and noise abatement technology, spatial/temporal restrictions on noisy activities, alternative foundation types. Applicants should undertake a review of up-to-date research should be undertaken and all potential mitigation options presented as part of the application,*	The details of marine mammal mitigation options for piling and UXO clearance, including at-source noise abatement methods, are presented within the **Draft Piling MMMP** (Document Reference: 7.14) and **Draft UXO Clearance MMMP** (Document Reference: 7.15). Additionally, where practicable the use of low order methods to dispose of UXOs using deflagration will be implemented (C-275).

Policy description	Relevance to assessment
having consulted the relevant JNCC mitigation guidelines."	See **Table 11-2** and **Table 11-14** for more details.

Local planning policy

11.2.5 **Table 11-4** lists the local planning policy relevant to the assessment of the potential effects on marine mammal receptors.

Table 11-4 Local planning policy relevant to marine mammals

Policy description	Relevance to assessment
South Inshore and Offshore Marine Plans	
These plans provide objectives and aim that are supported by detailed policies. The South Inshore Plan covers the coastline and shallow waters out to 12 nm. The South Offshore Plan covers the marine area from 12 nm to the Exclusive Economic Zone. The objectives that are relevant to marine mammals include: • Objective 10: To support marine protected area objectives and a well-managed ecologically coherent network with enhanced resilience and capability to adapt to change. • Objective 11: To complement and contribute to the achievement or maintenance of Good Ecological Status or Potential under the Water Framework Directive and Good Environmental Status under the Marine Strategy Framework Directive, with respect to descriptors for marine litter, non-indigenous species and underwater noise. • Objective 12: To safeguard space for, and improve the quality of, the natural marine environment, including to enable continued provision of ecosystem goods and services, particularly in relation to coastal and seabed habitats, fisheries and cumulative impacts on highly mobile species.	The potential effects of the construction, operation, and decommissioning phases of the Proposed Development on marine mammals have been assessed in the impact assessment (**Sections 11.9** to **11.12**).

Other relevant information and guidance

11.2.6 A summary of other relevant information and guidance relevant to the assessment undertaken for marine mammals is provided here:

- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects – Southall *et al.,* 2019. This piece of literature was used to provide the auditory thresholds for the species present, informing the underwater noise assessment.
- Beatrice Offshore Wind Farm: An interim estimate of the probability of porpoise displacement at different unweighted single-pulse sound exposure levels – Graham *et al.,* 2017. This piece of literature was used to provide a dose-response curve for harbour porpoises, which as there is no corresponding data for other species, was used as the threshold for the disturbance for all cetacean species.
- Estimating the effects of pile driving sounds on seals: Pitfalls and possibilities – Whyte *et al.,* 2020. This piece of literature was used to provide a dose-response curve for harbour seals, which as there is no corresponding data for grey seals, was used as the threshold for the disturbance of both seal species.
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications – Natural England, 2021a.
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase III: Expectations for data analysis and presentation at examination for offshore wind applications – Natural England, 2021b.
- Policy paper overview: Marine environment: unexploded ordnance clearance joint interim position statement – Defra, *et al.,* 2021.

11.3 Consultation and engagement

Overview

11.3.1 This section describes the stakeholder engagement undertaken for Rampion 2. This consists of early engagement, the outcome of, and response to, the Scoping Opinion in relation to the marine mammal assessment, the Evidence Plan Process (EPP), non-statutory consultation and Rampion 2's statutory consultation. An overview of engagement undertaken for Rampion 2 as a whole can be found in **Section 1.5** of **Chapter 1: Introduction, Volume 2** of the ES (Document Reference: 6.2.1).

11.3.2 Given the social distancing restrictions which have been in place due to the COVID-19 pandemic, all technical consultation relating to marine mammals has

taken place online, primarily in the form of conference calls using Microsoft Teams.

Early engagement

11.3.3 Early engagement was undertaken with a number of prescribed and non-prescribed consultation bodies in relation to marine mammal ecology, including Natural England, the MMO, the Sussex Wildlife Trust (TSWT), The Wildlife Trusts (TWT) and Whale and Dolphin Conservation (WDC). This engagement was undertaken to introduce the Proposed Development and the proposed approach to scoping the EIA.

Scoping Opinion

11.3.4 Rampion Extension Development Limited (RED) submitted a Scoping Report (RED, 2020) and request for a Scoping Opinion to the Secretary of State (administered by the Planning Inspectorate (PINS)) on 2 July 2020. A Scoping Opinion was received on 11 August 2020. The Scoping Report sets out the proposed marine mammal assessment methodologies, outline of the baseline data collected to date and proposed, and the scope of the assessment. **Table 11-5** sets out the comments received in Section 4 of the PINS Scoping Opinion 'Aspect based scoping tables – Offshore' and how these have been addressed in this ES. A full list of the PINS Scoping Opinion comments and responses is provided in **Appendix 5.2: Responses to the Scoping Opinion, Volume 4** of the ES (Document Reference: 6.4.5.2). Regard has also been given to other stakeholder comments that were received in relation to the Scoping Report.

Table 11-5 PINS Scoping Opinion responses – marine mammals

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
4.6.1	Temporary Threshold Shift (TTS) risk during construction. "*The Inspectorate is of the view that were TTS to be excluded from underwater noise assessments, the risk of cognitive impairment (TTS) will not be reflected in the overall assessment of risk to marine mammals, despite evidence in literature to suggest the potential for significant harm to individuals. The ES should therefore assess impacts to TTS from the Proposed Development across all marine mammal species scoped into the assessment where significant effects are likely to occur*."	Consideration of the potential for TTS effects on marine mammals has been included within **Sections 11.9** to **11.12** as appropriate.

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
4.6.2	Noise from cable laying, ground clearance, dredging etc during construction. "*The Scoping Report seeks to scope out noise from these activities on the basis that noise impacts will be "low in terms of intensity and duration, with a very localised risk*", *and that that risk is effectively contained within the assessment of 'vessel disturbance' activity (and ZOI defined in that respect). Without further reference to durations and methodologies of such activities in relation to vessel disturbance, and empirical evidence of the magnitudes of noise impacts from these activities when compared to vessel noise, the Inspectorate does not agree that they can be scoped out on the basis of the information provided. The Inspectorate also considers that there is the potential that noise generated from these activities could combine with vessel noise resulting in an overall larger impact and potentially more significant effect on marine mammals.*	The potential effects arising from underwater noise from these other, non-piling, sound sources have been assessed within **Sections 11.9** to **11.12**.
4.6.3	Reduction in prey availability during construction and operation. "*The Inspectorate is content that the potential for reduction in prey availability to result in a significant effect on marine mammals during operation can be scoped out of further assessment. The Inspectorate does not agree that such a conclusion is supported by the information available at this stage in respect of construction phase impacts. The Scoping Report states that there would be no significant direct effects on marine mammal prey species during construction (see the Benthic Ecology (5.5) and Fish and Shellfish*	The potential for indirect effects to marine mammals due to potential changes in prey availability during construction has been considered within **Section 11.9**.

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	Ecology (5.4) sections of the Scoping Report). The Inspectorate does not agree that significant indirect effects on marine mammals from loss of prey can be excluded at this stage."	
4.6.4	Risks to marine mammals of accidental pollution. "*The Applicant seeks to scope out the risks to marine mammals of accidental pollution occurring during construction, operation & maintenance or decommissioning of the Proposed Development the on the basis that a Marine Pollution Contingency Plan (MPCP) and emergency response plans will be implemented in the unlikely event that any such incident occurs. The Inspectorate agrees that, with the implementation of such measures, any potential impacts on marine mammals are unlikely to result in significant effects and therefore further assessment is not required. However, the Inspectorate considers that the detail of such measures, including how they would be employed and be secured should be presented within the ES. The ES should include draft versions (with sufficient detail) of any plans containing such measures.*"	The implementation of a MPCP and emergency response plans has been included as embedded environmental measures for the Proposed Development and have been detailed in **Table 11-14**. The MPCP has also been detailed in the Environmental Statement as requested by the Inspectorate and therefore accidental pollution remains scoped out at this stage of assessment.
4.6.5	Disturbance to seal haul out sites during construction. "*The Scoping Report seeks to scope impacts of the construction phase resulting in disturbance at a seal haul out sites. The baseline information shows that there is approximately 25-30km between the Proposed Development and the harbour haul out sites. The Inspectorate does not consider that sufficient evidence has been provided to support the contention*	Consideration of the potential for impacts to seal haul out sites during the construction phase is presented within **Section 11.9**.

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	that significant effects on haul out sites can be ruled out due to the separation distance. As set out in item 4.6.13, the spatial extent of the study areas for marine mammals are yet to be fully defined by the Applicant therefore the Inspectorate considers it is premature to agree to scope out such effects from further assessment at this stage. The ES should include this assessment where significant effects are likely to occur."	
4.6.6	Effects to marine mammals due to Electromagnetic Fields (EMF) during operation. "*The Inspectorate agrees that significant effects on marine mammals due to direct effects of EMF are unlikely during operation of the Proposed Development and agrees that this matter can be scoped out of further assessment. However, the Inspectorate notes that indirect effects from changes to prey availability from EMF (in terms of fish and benthic ecology) during operation will be considered.*"	The potential for indirect effects to marine mammals from changes in prey availability due to EMF during operation is presented in **Section 11.10.**
4.6.7	Zones of Influence (ZoI) and study areas. The ZoI for assessment of effects on marine mammals are stated as to be defined *"once project specific underwater noise modelling has been completed*". The Inspectorate considers that different cetacean species may require different ZoI's and study areas to be defined and notes that species have different Management Units. The ES should describe the approach to defining ZoI and study area across all species with reference to the outcomes of the evidence plan process. The relevant species for consideration in the context of the	A baseline characterisation has been presented in **Section 11.6**, with full details presented in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1). These characterisations present detail on the management units and the data sources and populations used for assessment purposes. A combination of both historic data sources (i.e. Rampion 1) plus contemporary data sources, including site specific surveys, has been used to enable a robust assessment. Due to the close proximity to Rampion 2, the

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	Proposed Development are harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin and minke whale, as informed by previous studies and experience from Rampion 1. As per the comments raised in sections 2 and 3 of the Scoping Report, reliance on an evidence base from Rampion 1 will need to be explained and evidenced as to how it remains temporally and spatially applicable.	Rampion 1 dataset is considered to be spatially relevant and more recent data sources, such as Rampion 2 site specific surveys and SCANS III (Hamond *et al.,* 2017) have been used to validate the information presented. A discussion is presented in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1) regarding the densities of the various species as recorded from numerous extensive data sources and includes a justification for the exclusion of white-beaked dolphin from the assessment.
4.6.8	Baseline data. "*Where the 'constantly expanding' marine mammal evidence base is used to provide new or updated baseline data than is referred to in the Applicant's Scoping Report and this Opinion, these should be set out clearly in the ES including reference to agreement as part of the evidence plan process*."	A baseline characterisation has been presented in **Section 11.6**, with full details presented in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1), including details of discussions through the EPP.
4.6.9	Basis for scoping assessment. Paragraph 5.7.22 omits any reference to seabed preparation works that may be required as set out in section 2 of the Scoping Report. The ES should consider the potential effects of such works on marine mammals.	Potential effects arising from seabed preparation works have been assessed as regards underwater noise and impacts to prey availability within **Section 11.9**.
4.6.10	Cumulative assessment study area and scope. "*The Applicant's proposed assessment of cumulative effects on marine mammals does not make specific reference to the study area(s) (which is still to be defined) for each species. Paragraphs 5.7.36 – 5.7.38 explain*	Consideration of cumulative effects is presented within **Section 11.12**, with inclusion of all relevant projects informed based on the study areas (as detailed in **Section 11.6**).

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	that the study area for cumulative effects remains "to be defined through evidence of potential connectivity". There is no specific reference to spatial and temporal overlap between construction of the Proposed Development and the AQUIND interconnector and the operation and maintenance activities associated with Rampion 1. These matters should be assessed in the ES where significant effects are likely.	
4.8.2	The Inspectorate welcomes the consideration of underwater noise and vibration during the construction, operation and decommissioning phases of the Proposed Development. Effort should be made to agree the methodology with the relevant consultation bodies and agreements should be clearly outlined within the ES. Early engagement with the MMO is encouraged to ensure that any noise modelling utilising site-specific physical parameters and project specific detail is appropriate and fit for purpose.	A description of the early engagement undertaken with various stakeholders can be found throughout **Section 11.3**. While 'Early Engagement' was not undertaken, the MMO were present during the "Offshore Ornithology, Marine Mammals and HRA (offshore only)" ETG on the 18 September 2020 (see EPP section below). Alongside the MMO, Cefas, Natural England, The Sussex Wildlife Trust (TSWT), The Wildlife Trusts (TWT), and Whale and Dolphin Conservation (WDC) were also invited to participate in the EPP as described below.
4.8.3	The baseline environment should be established beyond simply referring to the relevant aspect chapters where this information is presented. Potential noise and vibration impacts should be assessed against that baseline, noting that the underwater noise assessment draws entirely upon baseline data in other aspect chapters. The methods and noise propagation modelling software should be detailed within the ES; along with the project specific detail that it utilises with	The underwater noise technical modelling report (**Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3)) presents full details of the modelling methodology including establishment of the worst-case assumptions. The results of the modelling have been incorporated within the relevant aspect chapters to inform the assessments of impacts from underwater noise on the relevant aspects with due

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	reference to spatial, temporal and physical design envelopes.	consideration of the baseline environment.
4.8.4	The Inspectorate welcomes the collaboration with the other relevant aspects as set out in paragraph 5.9.1 of the Scoping Report. The ES should include appropriate cross-references between aspect chapters and avoid duplication and contradictory information.	Cross-referencing has been undertaken to relevant documents where appropriate to minimise duplication of information between chapters.
4.8.5	The possible modelling of noise from UXO is not referenced in this section. Elsewhere in the Scoping Report there is reference to UXO surveys yet to be conducted and that UXO removal may be required. The ES should therefore consider the potential for UXO underwater noise impacts of the Proposed Development where significant effects are likely to occur (including cumulative effects with other underwater noise producing activities	The predicted impact ranges from UXO clearance for a range of sizes has been modelled and is presented within (**Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3)). The potential effects arising from underwater noise from a range of sources including UXO have been assessed within **Sections 11.9** to **11.12**.

Evidence Plan Process (EPP)

11.3.5 The Evidence Plan Process (EPP) has been set up to provide a formal, non-legally binding, independently chaired forum to agree the scope of the EIA and Habitats regulations Assessment (HRA), and the evidence required to support the DCO Application. The EPP commenced in January 2020 and has continued throughout the EIA helping to inform the ES.

11.3.6 For marine mammals, further engagement has been undertaken via the EPP Expert Topic Group (ETG) Marine Mammals and HRA (offshore only) ETG. On 18 September 2020, the first ETG meeting was held where the scope of the assessment relating to the Scoping Opinion was discussed. The proposed methodology was presented and there was a brief discussion of key datasets. There was some disagreement over some scoped-out areas including construction noise, reduction of prey, disturbance at haul outs and TTS. There was a discussion around TTS ranges, and literature was suggested to resolve the disagreement. A plan was agreed to assess the areas of concern, with the assessment being raised with the MMO, Cefas and Natural England if impacts are deemed significant.

11.3.7 A follow up ETG was held on 26 March 2021, at which a high-level overview of baseline data collected since the last ETG was given and specific impacts to be assessed were discussed. Specific agreement from Natural England was sought and given on the exclusion of white-beaked dolphin from the assessment due to site specific data and wider scale survey data identifying no records of this species, this was confirmed in this ES chapter as no additional sightings occurred in the last 4 months of the site-specific surveys. It was agreed that consideration would be given within the assessment to the potential for impacts from non-piling underwater noise source such as dredging and seabed preparation works, alongside an assessment of appropriately justified, modelled, operational noise from the WTG sizes being proposed.

11.3.8 Following submission of the PEIR an Offshore Ornithology, Marine Mammal and HRA ETG was held on 2 November 2021 where updates to the project were discussed along with the Section 42 comments received from statutory consultation with statutory bodies, landowners, and the public. It was agreed that the majority of the comments would be incorporated in the ES, and any that could not be resolved would be discussed in targeted meetings. An additional Offshore Ornithology, Marine Mammals and HRA ETG was held on 12 April 2022 to discuss remaining Section 42 comments and updates to underwater noise modelling.

11.3.9 Further information is provided in the **Evidence Plan** (Document Reference: 7.21).

Non-statutory consultation

Non-statutory Consultation Exercise – January / February 2021

11.3.10 RED carried out a non-statutory Consultation Exercise for a period of four weeks from 14 January 2021 to 11 February 2021. This non-statutory Consultation Exercise aimed to engage with a range of stakeholders including the prescribed and non-prescribed consultation bodies, local authorities, Parish Councils, and general public with a view to introducing the Proposed Development and seeking early feedback on the emerging designs.

11.3.11 The key themes emerging from the non-statutory Consultation Exercise in January 2021 relating to marine mammals are:

- Need for consideration of protected species and marine protected areas.

11.3.12 Further detail about the results of the non-statutory Consultation Exercise can be found in the **Consultation Report** (Document Reference: 5.1).

Statutory consultation

11.3.13 Rampion 2's first statutory consultation exercise ran from 14 July to 16 September 2021, a period of nine weeks. The PEIR (RED, 2021) was published as part of Rampion 2's first statutory consultation exercise which provided preliminary information on shipping and navigation within Chapter 11: Marine mammals (RED, 2021).

11.3.14 Following feedback to the Statutory Consultation exercise in 2021 it was identified that some coastal residents did not receive consultation leaflets as intended.

Therefore, the first Statutory Consultation exercise was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. The original PEIR published as part of the first Statutory Consultation exercise in 2021 was unchanged and re-provided alongside the reopened Statutory Consultation exercise in early 2022.

11.3.15 The following statutory consultation exercises focussed on changes made to the onshore cable route, onshore substation, and National Grid interface point and did not consider offshore aspects of the Proposed Development.

11.3.16 The second Statutory Consultation exercise was undertaken from 18 October 2022 to 29 November 2022. This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works. As part of this second Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO application.

11.3.17 The third Statutory Consultation exercise was undertaken from 24 February 2023 to 27 March 2023. This was a targeted consultation which focused on a further single onshore cable route alternative being considered following feedback from consultation and further engineering and environmental works. As part of this third Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application.

11.3.18 The fourth Statutory Consultation exercise was undertaken from 28 April 2023 to 30 May 2023. This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the Rampion 2 onshore cable route into the national grid electricity infrastructure. As part of this fourth Statutory Consultation exercise, RED sought feedback on the proposed substation extension works to inform the onshore design taken forward to the DCO Application.

11.3.19 **Table 11-6** provides a summary of the key themes of the feedback received in relation to marine mammals and outlines how the feedback has been considered in this ES chapter. A list of comments received during the statutory consultation period and the responses to comments is provided in the **Consultation Report** (Document Reference: 5.1).

Table 11-6 Statutory consultation feedback

Stakeholder	Theme	How this is addressed in this ES
Natural England	According to paragraph 2.6.92 of the Overarching National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (July 2011), the Applicant should provide information on the baseline noise levels. This information has not been provided within the marine mammal chapter.	The background noise levels in the sea for UK waters are up to 130 dB re 1 µPa. Additional details background underwater noise levels are presented in **Section**

Stakeholder	Theme	How this is addressed in this ES
		2.1 of **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) and **Underwater noise study for sea bream disturbance** in **Appendix D, Evidence Plan Report:** (Document Reference: 7.21)
Natural England	To demonstrate that comment 4.6.9 (in relation to the effects of seabed preparation on marine mammals) has been addressed, we advise that the impact assessment of "Changes to prey availability" (paragraph **11.9.74**) list the different impact pathways assessed in the fish and shellfish chapter. Furthermore, we consider that impact assessment does not detail the fish and shellfish baseline in sufficient detail (see comment 4.8.3), as it is not clear which species in Table 11-33 are actually present in the area.	The different impact pathways have been listed in paragraph **11.9.75**. Clarification of which species are in the area has been included in **Table 11-32** with species in the area identified with an asterisk.
Natural England	We advise that this paragraph should be clarified as the current wording is unclear. Furthermore, Natural England considers that the maximum zone of influence for underwater noise should be based on the underwater noise modelling and may be different between species (as per Scoping Opinion comment 4.6.7).	The wording in **paragraph 11.4.2** has been amended for clarity. The ZOI is the study area for marine mammals and is not based on noise modelling. There are two study areas on different scales for marine mammals, the local study area which encompasses the survey area and the wider study area which is based on species Management Units (MUs).
Natural England	The total number of piles required across both the WTG and offshore substation	The worst-case scenario has been updated to 90

Stakeholder	Theme	How this is addressed in this ES
	foundation installation is 119 monopiles or 482 pin piles. Both the underwater noise technical assessment and the marine mammal assessment only reference the total number of piles/days of piling for the WTG; they have not included the piling for the offshore substation foundation installation.	monopiles and 360 pin pile. The impact ranges presented in **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) have fed into the marine mammal assessment undertaken in **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.1) and **Section 11.9**.
Natural England	Natural England notes that in some of the assessments, the worst-case impact ranges arise from pin piles rather than monopiles e.g. maximum PTS ranges for marine mammals (specifically LF cetaceans).	The reference to monopiles giving largest spatial impact in **Table 11-13** has been removed and the text has been updated to reflect the updated modelling results.
Natural England	Natural England advises that information is included here on the worst-case scenario for concurrent piling. Appendix 11.3 does not assess simultaneous piling; however, Appendix 11.2 has included the possibility of concurrent piling of monopiles at the northwest and east locations. It is unclear if there is the potential for concurrent piling of monopiles and multileg foundations. Given the potential for concurrent piling, we advise that the assessment of simultaneous piling at the NW and E modelled locations are not strictly the full worst- case, because it is possible for concurrent piling to occur at two locations that are further apart within the site i.e. furthest east and west locations.	The worst-case scenario modelling has been updated to include North, South, West and East modelling locations for both monopiles and pin piles (see **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) and **paragraph 11.9.5**). A worst-case of concurrent (simultaneous) piling at the West and East locations has been assessed in **Section 4** of

Stakeholder	Theme	How this is addressed in this ES
		Appendix 11.3 Underwater noise assessment technical report, Volume 4 of the ES (Document Reference: 6.4.11.3) and **Sections 3 – 5** of **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2).
Natural England	Natural England notes that in the assessment of vessel collision risk, the Applicant states that a Marine Wildlife Watching Code (MWWC) will be followed, in order to reduce the risk of collision. Natural England welcomes the Applicant's commitment to a MWWC. As this measure is being relied on in order to reduce the significance of the impact, we require that adherence to it is secured as a condition in the DCO or DML (or as part of a Plan that is secured in the DCO or DML). Natural England request to be a named consultee of the MWWC.	Adherence to a MWWC will be incorporated into the VMP (C-51) further details included in ES chapter (**Table 11-14**). Natural England will be named as a consultee.
Natural England:	It is not the case that all sources have impact ranges <100m for all species. We note that, as per **Table 5-4 in Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) the impact (TTS) ranges from suction dredging, rock placement and vessel (large) are all greater than 100m for very high frequency cetaceans.	The text in **paragraph 11.9.42** has been updated to reflect the correct TTS ranges.
Natural England	The assessment of magnitude is minor; this is the same as for construction, however the assessment of vessel collision risk from construction also took into account two mitigation measures (a MWWC and a VMP). We do not agree that the magnitude is minor	Adherence to a MWWC as part of the VMP (C-51, **Table 11-14**) has been specified so as to ensure consistency between magnitudes of

Stakeholder	Theme	How this is addressed in this ES
	without these mitigation measures. We advise that adherence to a MWWC is undertaken during O&M vessel movements, as best practice.	collision risk at different stages of the project.
Natural England	The Applicant states that animals will return to the area when vessel disturbance has ended. On what timescale might animals return? No information has been provided on the typical duration of vessel presence on site, or time between vessels being on site, therefore it is not possible to determine the extent to which animals will continue to use the site outside of vessel disturbance periods.	Information has been provided in **paragraph 11.9.61** on disturbance from vessels.
Natural England	The JNCC and Natural England Suggested Tiers for Cumulative Impact Assessment should be used	Tiers for CIA have been included and updated in **Table 11-33**.
Natural England	We require further clarification as to how the list of other developments were selected, and why other types of development were screened out.	All offshore projects within the relevant marine mammal MU were screened into the CIA long-list. These were screened further to obtain the short-list by screening out impacts that are highly localised, where mitigation will be in place and where the potential impact from Rampion 2 alone was negligible (e.g. PTS, vessel collision). This is detailed in **paragraph 11.12.6** et seq.
Natural England	The Applicant has screened out collision with vessels, citing VMPs for offshore energy projects, however two other development types are also being considered – subsea cables and pipelines, and seismic surveys. Our understanding is that VMPs are not used in seismic surveys, therefore collision risk cannot be ruled out and should be screened into the cumulative impact assessment.	Alongside VMPs, vessels for other offshore developments should also be adhering to the MWWC as part of the VMP (C-51), therefore the risk of vessel collision will be minimised.

Stakeholder	Theme	How this is addressed in this ES
Natural England	We cannot agree that seal species can be scoped out of the CEA, as no justification has been presented with regards to disturbance from vessel activity. The Applicant has only presented justification for screening them out from cumulative underwater noise disturbance from construction.	Confusion has been made with screening in for HRA and scoping in for EIA. Seals have been included in the CEA for vessel disturbance **Table 11-45**.
Natural England	Natural England advises that the following projects require consideration for **Table 11-35**: Awel y Mor, Berwick Bank, Dolphyn project (as potential for driven pile anchors), Dudgeon extension project, Five Estuaries, Marr Bank, North Falls, Sheringham Shoal extension project. All these projects occur within the MUs for marine mammals and have the potential to include piling.	**Table 11-34** has been updated to include all projects within the species specific MUs.
Natural England	Has the Applicant considered that UXO clearance works may be required as part of the AQUIND Interconnector works? In addition, rock placement may be undertaken as part of the works which has a larger impact (TTS) range than large vessels, based on underwater noise modelling (Appendix 11.3, Table 5-4). Therefore, we do not agree that the AQUIND Interconnector can be screened out of the construction noise cumulative assessment.	Following the SoS decision to refuse consent for AQUIND Interconnector in January 2022, it was subject to a judicial review in November 2022. In January 2023 the decision was overturned and the application is to be redetermined, therefore it remains scoped in for the CEA on marine mammals. As there is the potential for UXO clearance, AQUIND and other Interconnector cables have been scoped into the cumulative noise assessment (**Table 11-37**, **Table 11-39**, **Table 11-41** and **Table 11-43**), as well as the cumulative vessel assessment (**Table 11-45**).

Stakeholder	Theme	How this is addressed in this ES
Natural England	The percentages of the MU presented in this table appear to be incorrect. Based on Appendix 11-1, Volume 4, the reference population is 23,528. So, for example, affecting a total of 395 animals would constitute 1.67%, not 0.11% as is presented.	The MU figures for **Table 11-40** have been recalculated based on updates to the CEA.
Natural England	The Applicant has not assessed the potential for cumulative vessel disturbance effects during the operation and maintenance phase of the Rampion 2 project. There has not been consideration of projects that do not overlap with the construction phase of the project but may act cumulatively with the O&M phase and associated increase in vessels.	Cumulative vessel disturbance during operation and maintenance has not been included as expected levels of vessel activity during the O&M phase are considerably lower than during construction. Additionally it is expected all vessels will adhere to a MWWC, as part of the VMP (C-51), to reduce impacts.
SWT & TWT	Include UXO information from nearby historical projects such as Rampion 1. This will help RWE to provide an indicative figure for UXO clearances specific to Rampion 2. We expect all offshore wind farm developers to undertake more pre-consent surveys to gain a realistic figure of required UXO clearances. We believe UXO clearance activity should be conditioned at the DCO stage, through the inclusion of a dML, then it could be better planned and managed in combination with other projects.	Historical projects have been reviewed and included in the **paragraph 11.9.31** to inform estimates for Rampion 2. Pre-consent surveys will be undertaken to establish the number of UXO and potential UXO within the project boundary and surrounding area. UXO clearance will be controlled through a separate dML.

Stakeholder	Theme	How this is addressed in this ES
SWT & TWT	We are disappointed that our comment on the Scoping Report regarding the inclusion of the following data sources has not been addressed in the PEIR: • The Brighton Dolphin Project: Citizen Science research project. (Link corrupted) • The Sussex Biodiversity Record Centre: Contains marine and terrestrial data from a variety of sources, including local recorders, members of the public and ecological consultants, https://sxbrc.org.uk/services/dataRequests.php	The information from Brighton Dolphin Project (now Sussex Dolphin Project) was sought after but not possible to obtain. The information from Sussex Biodiversity Record Centre was sought after but not comprehensive enough for inclusion in the **Section 11.5** or as a data source in **Table 11-10**.
SWT & TWT	Noting the comment in Paragraph 11.6.11 that predicting the future trajectories of marine mammal populations has been challenging due to the lack of monitoring data, the development of a strategic approach to monitoring between Rampion 1 and Rampion 2 will yield useful results and maximise the use of resources. As stated in our comments on the Scoping Report, we are disappointed that there has been no discussion of plans for future monitoring at this stage. It is critical that monitoring and mitigation requirements are discussed before examination.	Marine mammal monitoring is detailed in the **Offshore In Principle Offshore Monitoring Plan** (Document Reference: 7.18). The **Draft Piling MMMP** (Document Reference: 7.14) and **Draft UXO Clearance MMMP** (Document Reference: 7.15) which detail the proposed mitigation for marine mammals have been submitted alongside the ES.
SWT & TWT	It should be noted that we do not support the use of high order detonation for most UXO clearance activities. We request that when the draft UXO-specific MMMP is developed, RWE commits to recording and providing information on the success rate of any low order technology used during the project to regulators, SNCBs and other interested parties such as TWT & SWT to confirm the effectiveness of the technique in mitigating the impacts of underwater noise. If RWE intends to use low-yield technology then the requirement to use a bubble curtain should	A **Draft UXO Clearance MMMP** (Document Reference: 7.15) has been submitted alongside the ES. Additionally, where practicable the use of low order methods to dispose of UXOs using deflagration will be implemented (C-275).

Stakeholder	Theme	How this is addressed in this ES
	form part of the licence condition, due to the lack of evidence surrounding this technique	
SWT & TWT	A great deal more work is required to understand the effectiveness of current mitigation for underwater noise impacts and to develop better options if the current mitigation is found to be inadequate. We suggest that monitoring is undertaken to confirm the effectiveness of ADD if this is utilised.	More assessment into effectiveness of mitigation measures may be required and will be considered for the Final MMMPs when final ADD choice has been made post-consent and just prior to construction.
SWT & TWT	Is RWE satisfied that 525 kg is the maximum worst case charge weight that will be encountered across the project? Is there reason to believe that a charge weight of >525kg (e.g. used for the clearance German land mines) will not be needed for this project?	Given the close proximity of Rampion 2 to Rampion 1, a charge weight of 525kg has been used as the maximum worst case charge weight for the project based on the previous charges found at Rampion 1. This is therefore the maximum that has been considered in **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) and **Table 11-30**.
SWT & TWT	We do not agree that there will be no significant effect on marine mammal food availability during the construction phase. Please refer to comment above on section 8.9.30.	RED have confirmed mitigation measures for sensitive features in a targeted meeting with stakeholders on 24 February 2022. The use of primary and secondary mitigation measures will be used to reduce or avoid the effects on key prey species, see **Chapter 8: Fish and shellfish ecology, Volume 2** of

Stakeholder	Theme	How this is addressed in this ES
		the ES (Document Reference 6.2.8) **paragraphs 8.9.64 to 8.9.65 and 8.9.259** for more information on mitigation measures for fish.
SWT & TWT	We are disappointed that fishing has been considered as part of the baseline and has not been included in the CEA for marine mammals. Fishing is a licensable activity that has the potential to have an adverse impact on the marine environment, including marine mammals.	The CEA for marine mammals examines the combined impacts of Rampion 2 in combination with other developments, as fishing is not a development it has not been assessed in **Section 11.12**. The full list of the types of development included in the CEA are listed in **paragraph 11.12.6** and those excluded from the CEA (including changes in prey availability) are listed in **paragraph 11.12.7**. Impacts to changes in prey availability are assessed in **Sections 11.9, 11.10** and **11.11**.
MMO	To clarify, and as explained on previous occasions, the MMO do not necessarily agree that it is not possible carry out carry out a quantitative assessment of the magnitude or significance of the impact of TTS on marine mammals. Nevertheless, Cefas requested, and are content for the TTS ranges to be presented alongside an estimate of the potential number of animals within these impact ranges, and this was agreed at the ETG meeting in September 2020.	Cefas are content with TTS ranges.
MMO	Appendix 11.2 Paragraph 2.4.3 Temporary threshold shift (TTS) assessment (paragraph 2.4.3 onward on page 15)	The assessment approach is aligned with the most up to date

Stakeholder	Theme	How this is addressed in this ES
	The information presented in this section only demonstrates what is not known about the significance of TTS – there is no evidence presented to confirm that it isn't significant, only conjecture. One could equally argue that at lower received sound levels, animals are less likely to flee (see Graphic 2-2), and so proportionally more likely to induce TTS than this assessment suggests. The TTS/PTS (Permanent Threshold Shift) assessment seems to consider only an animal fleeing directly away from the source, whereas Graphic 2-2 demonstrates that even at received SEL_{ss} (single strike sound exposure level) of 160 dB, around 10% of animals will not flee, so there are uncertainties which tend toward underestimation of risk here too	guidance from Natural England. As agreed with CEFAS at the Expert Topic Group meeting dated 18/09/2020 TTS-onset ranges were modelled and presented alongside an estimate of potential number of animals impact but it is not possible to carry out quantitative assessment of sensitivity or magnitude, and therefore cannot reach a conclusion on significance. There is currently no threshold for TTS-onset to indicate level at which they would be biologically significant. This approach has been approved for Hornsea Four Offshore Wind Farm and Awel y Môr Offshore Wind Farm,
MMO	Appendix 11.2 paragraph 2.5.3 This kind of anthropomorphising is misguided and unhelpful. Marine mammals rely on sound as their primary sensory modality, whereas humans are primarily visual creatures. While audiometric data from humans can be useful to make quantitative extrapolations for marine mammals (since they share a similar inner ear structure), it will be unwise to state that what is considered 'mild' hearing loss in humans has any relevance to the severity of consequences of hearing loss in marine mammals	The text in this paragraph has been removed to avoid any anthropomorphising, please see **Section 2.5** of **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2).
	Appendix 11.2 paragraph 2.5.6 All cetaceans have been assessed as having a Medium sensitivity to PTS. RED have not demonstrated that PTS will have merely a	Sensitivity of marine mammals to PTS has been assessed in **Section 3** of **Appendix**

Stakeholder	Theme	How this is addressed in this ES
	medium risk, only that there is uncertainty about how significant PTS may be for individual animals. Until and unless empirical evidence can shed light on whether this opinion holds water, the precautionary principle will continue to apply. The MMO requests that cetaceans should be assessed as having a high sensitivity to PTS.	**11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2).

11.4 Scope of the assessment

Overview

11.4.1 This section sets out the scope of the ES assessment for marine mammals. This scope has been developed as Rampion 2 design has evolved and responds to feedback received to-date as set out in **Section 11.3**.

Spatial scope and study area

11.4.2 The marine mammal study area varies depending on the species, considering individual species' ecology and behaviour. For all species, the study area covers the Rampion 2 array area and offshore Export Cable Corridor (ECC) and is extended over an appropriate area considering the scale of movement and population structure for each species. For each species, the area considered in the assessment is largely defined by the appropriate species Management Unit (MU). The study area for marine mammals has been defined at two spatial scales: the MU scale for species specific population units and the marine mammal survey areas for an indication of the local densities of each species.

11.4.3 When considering the wider MU scale study area, the potential species that may be found at the ES boundary need to be considered. The ES for the existing Rampion 1 project reported six species of marine mammal during site specific surveys: harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale (assumed), common (harbour) seal, and grey seal. The Rampion 2 site-specific surveys have recorded harbour porpoise, common dolphin, unidentified dolphin and unidentified phocid seal.

11.4.4 For seals, the Proposed Development lies close to the boundary of two seal MUs, the south east England and south England units (as depicted in SCOS, 2018). Cetaceans, however, have different MUs per species, with the relevant area provided for cetacean species given in IAMMWG, 2022. The ES boundary lies within the North Sea MU for harbour porpoise, the Offshore Channel, Celtic Sea & South West England MU for bottlenose dolphin, and the Celtic & Greater North Seas MU for common dolphin, white beaked dolphin and minke whale. These MUs are depicted in **Figure 11-1, Volume 3** of the ES (Document Reference: 6.3.11).

11.4.5 For the ES the study area was reviewed and amended again based on project design updates and refinement the proposed DCO Order Limits following statutory consultation responses (Section 42). These included refinement of the cable route, substation locations and offshore boundary.

11.4.6 For marine mammals the study area varies depending on the species, by considering individual species ecology and behaviour. The study area covers the Rampion 2 array area and offshore Export Cable Corridor (ECC) and is extended over an appropriate area largely defined by the appropriate species MU The study area is defined at both the MU scale and at the survey area scale (**Appendix 11.1: Marine Mammal Baseline Report, Volume 4** of the ES (Document Reference: 6.4.11.1)

Temporal scope

11.4.7 The temporal scope of the assessment of marine mammals is the entire lifetime of Rampion 2, which therefore covers the construction (4 years), operation and maintenance of around 30 years, and decommissioning phases.

Potential receptors

11.4.8 The spatial and temporal scope of the assessment enables the identification of receptors which may experience a change as a result of Rampion 2. The receptors identified that may experience likely significant effects for marine mammals are outlined in **Table 11-7**.

Table 11-7 Receptors requiring assessment for marine mammals

Receptor group	Receptors included within group
Marine mammal receptors	Any marine mammals present within the study area including those identified above (harbour porpoise, common dolphin, bottlenose dolphin, minke whale, harbour seal and grey seal)

Potential effects

11.4.9 Potential effects on marine mammal receptors that have been scoped in for assessment are summarised in **Table 11-8**. This comprises those impacts which were scoped in within the Scoping Report (RED, 2020), plus those which the PINS did not agree could be scoped out based on the information presented within the Scoping Report.

Table 11-8 Potential effects on marine mammal receptors scoped in for further assessment

Receptor	Activity or impact	Potential effect
Construction		
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Noise generated from construction activities	Underwater noise resulting from percussive piling and clearance of UXO has the potential to result in PTS (injury - permanent shift in hearing threshold) and TTS (recoverable shift in hearing threshold) in marine mammals. Underwater noise from piling and UXO, plus other construction related activities (cable laying, ground clearance, dredging, seabed prep, and vessel movements, etc,) may result in disturbance to marine mammals.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Vessel collision risk	Although an increase in baseline collision risk is considered highly unlikely, if a collision were to occur, the consequences would be serious to the fitness of that individual. Mitigation measures will be put in place to ensure that this risk is minimised as far as possible.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Vessel disturbance	Marine mammals may potentially be disturbed by the presence of vessels (separate from the potential impacts from underwater noise), however mitigation measures will be put in place to ensure that the risk is minimised as far as possible.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Changes to prey availability	Construction activities may have the potential to alter prey availability for marine mammals, resulting in indirect effects to marine mammals.
Marine mammal ecology: Pinnipeds – grey seal and harbour seal.	Disturbance to seal haul out sites at landfall	Construction activities may have the potential to disturb seal species while at their haul out sites.

Receptor	Activity or impact	Potential effect
Operation		
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Noise generated from operation	Operational noise from offshore wind farms to date has been found to be not significant for marine mammals. However, the size of WTGs planned at the Proposed Development do not have empirical data for operational noise and therefore scoped in as a precaution.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Vessel collision risk	Although an increase in baseline collision risk is considered highly unlikely, if an individual was collided with, the consequences would be serious to the fitness of that individual. Mitigation measures will be put in place to ensure that this risk is minimised as far as possible.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Vessel disturbance	Marine mammals may potentially be disturbed by the presence of vessels (separate from the potential impacts from underwater noise), however mitigation measures will be put in place to ensure that the risk is minimised.
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	Changes to prey availability	EMF from cabling has the potential to impact prey availability for marine mammals, resulting in potential indirect effects on marine mammals. This is assessed in **Chapter 8: Fish and Shellfish Ecology, Volume 2** of the ES (Document Reference: 6.2.8) and it is considered to not have an impact on marine mammals.
Decommissioning		
Marine mammal ecology: Harbour porpoise, common dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal.	As for construction but likely to be reduced in magnitude	

Activities or impacts scoped out of assessment

11.4.10 A number of potential effects 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 11-9** and an indication given of whether the scope has evolved since Scoping. Those activities below are those which PINS, in its Scoping Opinion, has agreed can be scoped out based on current information.

Table 11-9 Activities or impacts scoped out of assessment

Activity or impact	Rationale for scoping out
Accidental pollution from construction and operation	No Likely Significant Effect (LSE). The requirement for embedded mitigation results in no likely significant effect.
EMF from operation.	No LSE. No significant direct effect to marine mammals detected from offshore wind farms.

11.5 Methodology for baseline data gathering

Overview

11.5.1 Baseline data collection has been undertaken to obtain information over the study areas described in **Section 11.4: Scope of the assessment**. The current baseline conditions presented in **Section 11.6: Baseline conditions** sets out data currently available information from the study area/s.

Desk study

11.5.2 The data sources that have been collected and used to inform this marine mammal assessment are summarised in **Table 11-10**.

Table 11-10 Data sources used to inform the marine mammals ES assessment

Source	Date	Summary	Coverage of study area
Rampion 2 surveys	Apr 2019 – Mar 2021	Digital aerial surveys.	proposed DCO Order Limits + 4 km buffer.

Source	Date	Summary	Coverage of study area
Rampion 1 surveys	Mar 2010 – Feb 2012	Boat based visual surveys	Rampion 1 array area application boundary + 5 km buffer.
SCANS III (Hammond *et al.*, 2017)	July 2016	Abundance estimates for small cetacean populations.	UK wide
JCP Phase III (Paxton *et al.*, 2016)	1994-2010	Estimations of spatial and temporal abundance patterns.	UK wide
JCP Phase III Data Analysis Product	1994 and 2010	JCP dataset: 38 sources, totalling over 1.05 million km from a variety of platforms.	UK wide. Specific estimates provided for Hastings and Isle of Wight.
Heinänen and Skov (2015)	1991-2011 (Summer: Apr-Sep, Winter: Oct-Mar)	Density surface maps produced from the JCP dataset.	UK wide
MERP Cetacean distribution maps (Waggitt *et al.*, 2020)	1980-2018	Species distribution maps available at monthly and 10 km^2 density scale.	UK wide
Sea Watch Foundation Sightings (Castles, 2020)	2007 - 2019	Sightings distribution maps.	Waters around the Isle of Wight.
ORCA sightings	2011-2020	Sightings and effort data from opportunistic ferry surveys.	Ferry route between Portsmouth and Caen.
Seal haul-out counts (provided by SMRU)	August counts: 1996-2020 (harbour and grey seal) Autumn counts: 1989-2020 (grey seal pups)	Haul-out count data for population estimates.	UK wide

Source	Date	Summary	Coverage of study area
Seal telemetry (provided by SMRU)	1988-2018	Information on GPS location, track data and dive data.	UK wide
Sea at-sea usage (Russell *et al.*, 2017)	1991-2015	Average seal at-sea distribution estimates at a 5km grid resolution.	UK wide
Habitat based distribution (Carter *et al.*, 2020 and 2022)	2005-2019	Habitat preference and at-sea distribution estimates at 5 km grid resolution.	UK wide
The Solent Seal Project (Castles *et al.*, 2021, Chesworth *et al.*, 2010)	Counts: 1999-2019 Telemetry 2009	Annual august haul out counts of seals in the Solent. Telemetry data for 5 harbour seals tagged at Chichester and Langstone harbours.	The Solent
SAMM surveys (Laran *et al.*, 2017)	Nov 2011 – Aug 2012	Large scale aerial surveys.	English Chanel and the Bay of Biscay.
French seal data (Vincent *et al.*, 2017)	1999-2014	45 grey and 28 harbour seals tagged.	English Channel and French coast.

Site surveys

11.5.3 Monthly digital aerial surveys covering the survey area were conducted from April 2019 to March 2021, resulting in 24 surveys. At the time of the publication of the PEIR, only 20 months of data were available to include in the baseline characterisation (April 2019 – November 2020). The final baseline technical report for this ES chapter contains the full 24 months of survey data which has been analysed.

11.5.4 Population estimates for each survey month were extracted by multiplying the mean number of animals per image, by the total number of images covering the

study area. Using non-parametric, bootstrap methods, species-specific monthly abundance estimates were calculated from the raw count data, with upper and lower confidence limits included. Where appropriate, precision was also presented for each estimate. Dividing these estimates by the size of the area covered, generated the associated density estimates for all species. Detail on the site-specific surveys conducted is provided in **Table 11-11** (and reported on in full in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1).

Table 11-11 Site surveys undertaken

Survey type	Scope of survey	Coverage of study area	Survey status
Rampion 2 Monthly Digital Aerial Surveys	A suite of 24 monthly surveys to collect baseline data on marine mammals associated within the area of the proposed development	The survey tracks ensure representation of the entire survey area. As per the survey design, the survey tracks cover greater than 10% of the survey area. The full survey area has been covered for the ES.	This ES chapter contains the full 24 months of data which has been analysed and is therefore available for the complete characterisation of marine mammal receptors

Data limitations

11.5.5 The key data limitations with the baseline data and their ability to materially influence the outcome of the EIA are the high spatial and temporal variation in marine mammal abundance and distribution in any particular area of the sea. **Appendix 11.1: Marine Mammal Baseline Technical Report, Volume 4** of the ES (Document Reference: 6.4.11.1) details the data sources used in the assessment and their associated assumptions and limitations.

11.6 Baseline conditions

11.6.1 The following sections provide a summary of the baseline conditions for marine mammal receptors. Detailed descriptions are included in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1).

Current baseline

11.6.2 The marine mammal baseline characterisation is presented in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1). The baseline characterisation details the occurrence of

marine mammal species present in the study area, compiled through a combination of literature reviews and data obtained from site-specific surveys.

11.6.3 The Rampion 2 site-specific surveys resulted in sightings of harbour porpoise and common dolphin, alongside a number of unidentified cetaceans and seals. Harbour porpoises were recorded in only eight of the 24 surveys. This resulted in a maximum density estimate of 0.05 porpoise/km^2 within the Survey Area (Rampion 2 array area + 4 km buffer) and an average density across all 24 surveys of 0.01 porpoise/km^2. Only one common dolphin was sighted during the 24 months of site-specific surveys. The average density estimate across all surveys to date in the survey area was 0.001 dolphins/km^2. The unidentified cetaceans, presumed to be either a dolphin or porpoise species, were seen in ten of the survey months. This resulted in a an average density estimate across all surveys of 0.01 individuals/km^2. The unidentified seals, presumed to be either grey or harbour seals, had a peak count in July when three seals were counted.

11.6.4 While not sighted during the Rampion 2 site-specific surveys, bottlenose dolphins and minke whales have been sighted during local and opportunistic surveys in the area, and so they have been scoped into the assessment within this ES chapter.

11.6.5 The conclusion of the baseline characterisation uses all the data sources selected (see **Section 11.5**) to identify the key marine mammal species within the study area, and a set of recommended density estimates and Management Units for each species to be used in this ES chapter (**Table 11-12** and **Figure 11.1, Volume 3** of the ES (Document Reference: 6.3.11)).

Table 11-12 Marine mammal density estimates, and reference population information used in the impact assessment

Species	Density (#/km^2)	Source	Reference population	Reference population size	Source
Harbour porpoise	0.213	SCANS III (Hammond *et al*., 2017)	North Sea MU	346,601	(IAMMWG, 2022)
Bottlenose dolphin	0.037	SAMMS surveys (Laran *et al*., 2017)	Offshore Channel and SW England	10,497	(IAMMWG, 2022)
Common dolphin	0.171	SAMMS surveys (Laran *et al*., 2017)	Celtic and Greater North Seas	102,656	(IAMMWG, 2022)
Minke whale	0.002	SCANS III (Hammond *et al*., 2017)	Celtic and Greater North Seas	20,118	(IAMMWG, 2022)

Species	Density (#/km^2)	Source	Reference population	Reference population size	Source
Harbour seal	Grid cell specific	Habitat preference (Carter *et al*., 2020)	50 percent South & South-east England MUs combined	2,633	2019 counts provided by SMRU
Grey seal	Grid cell specific	Habitat preference (Carter *et al.,* 2020)	50 percent South and South-east England MUs combined	36,368	2019 counts provided by SMRU

11.6.6 As detailed in **Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1), white-beaked dolphins are considered to be very rare visitors to the survey area, with no sightings during the site-specific aerial surveys (24 months of data), SCANS III, JCP or ORCA surveys. Rampion 1 surveys recorded a single individual on one occasion during the full 30 surveys undertaken for that project, with the only other records of white-beaked dolphin in the area from Sea Watch surveys, for which density estimates are not available. Based on the extremely low number of sightings of white-beaked dolphin, particularly in the more recent surveys, this species was scoped out of the PEIR, as discussed and agreed at the ETG on 26 March 2021. Following the finalisation of the site surveys and inclusion of the full 24 months of data, the decision was made that white-beaked dolphin remain scoped out of the ES.

11.6.7 Both harbour and grey seals can be observed within the English Channel, albeit at typically lower numbers than other areas of the UK. The Proposed Development is located within the South seal MU, however it is adjacent to the border of the South-east England MU. As the Proposed Development has the potential to impact both MU populations, Natural England have advised that it would be pragmatic for the reference population for the harbour seal assessments to be comprised of 50% of the South MU and 50% of the Southeast MU population. For grey seals, given their wider ranging behaviour, the entirety of both MUs have been considered as the reference population against which to assess impacts.

11.6.8 The closest harbour seals haul outs are around the Solent and adjacent harbours, approximately 11km distant, where low numbers of harbour seals have been estimated (40 individuals, SCOS, 2018). Three years' worth of harbour seal photo-ID data indicate site fidelity in Chichester harbour (Castles *et al.,* 2021). Significantly larger harbour seal haul outs can be found into the North Sea, from the outer Thames northwards, however there is no evidence of connectivity between the Solent seals and the Southeast England MU seals and beyond (**Appendix 11.1: Marine mammal baseline technical report, Volume 4** of the ES (Document Reference: 6.4.11.1)). Habitat preference modelling indicates low harbour seal densities at sea in the English Channel (Carter et al 2020).

11.6.9 The closest grey seal haul out site to the Proposed Development is at Chichester Harbour, where grey seal August counts are low (12 in 2019, Castles *et al.,* 2021). Grey seal tagging data indicates a degree of connectivity among grey seals towards the western end of the English Channel and among those towards the eastern end of the English Channel, but not connectivity east to west (Vincent *et al.,* 2017). Habitat preference modelling indicates low grey seal densities at sea in the English Channel (Carter *et al* 2020).

11.6.10 A summary of the species sighted during the site-specific surveys is presented in **Figure 11-2, Volume 3** of the ES (Document Reference: 6.3.11).

Future baseline

11.6.11 It is challenging to predict the future trajectories of marine mammal populations in the absence of the Proposed Development. Some UK marine mammal populations have undergone periods of significant change in parts of their range, with a limited understanding of the driving factors responsible. For example, there is uncertainty about whether it is an increase in pup survival or increases in fecundity that has been responsible for the recent exponential growth of grey seals in the North Sea (Russell, 2017). Additionally, monitoring is not in place at the relevant temporal or spatial scales to really understand the baseline dynamics of some marine mammal populations.

11.6.12 The most recent UK assessment of conservation status for cetaceans resulted in an assessment of unknown[3] for harbour porpoise (JNCC, 2019a), white-beaked dolphin (JNCC, 2019b), common dolphin (JNCC, 2019c), bottlenose dolphin (JNCC, 2019d) and minke whale (JNCC, 2019e). For seals the assessment concluded unfavourable – inadequate for common (harbour) seal (JNCC, 2019f), and favourable for grey seals (JNCC, 2019g). These assessments take into consideration the short term and long-term trends of the populations and provide an assessment of the future prospects of the population. For harbour porpoise both the short- and long-term trends in population size were categorised as unknown, with favourable status for range and habitat and the assessment resulted in a conclusion of having unknown future prospects. For common dolphin, bottlenose dolphin and minke whale, the long-term trends in population and habitat were unknown with favourable prospects for range, and the assessment resulted in a conclusion of unknown future prospects for each species overall. For grey seals the long-term trends in population size were categorised as increasing and the assessment resulted in a conclusion of the species having favourable future prospects. For harbour seals both the short- and long-term trends in population size were categorised as decreasing and the assessment resulted in a conclusion of the species having poor future prospects.

11.6.13 The potential impacts of climate change on marine mammals were reviewed and synthesised by Evans and Bjørge (2013). They concluded that the impacts of climate change on marine mammals remain poorly understood. In the UK, changes are predicted to manifest in relation to changes in prey abundance and

[3] An assessment of unknown is determined when there is insufficient information to make a valid assessment. In the case of an unknown assessment a precautionary approach is taken.

distribution as a result of warmer sea temperatures, and enhanced stratification forcing earlier occurrence of the spring phytoplankton bloom and potential cascading effects through the food chain (Evans and Bjørge 2013). The authors also conclude that the NW European species likely to be most affected in the future will be those that have relatively narrow habitat requirements and that shelf sea species like the harbour porpoise and minke whale may come under increased pressure with reduced available habitat, if they experience range shifts northwards. Although the main cause of widespread declines in UK harbour seal population is not known, the prevalence in the population of domoic acid derived from toxic algae may be a contributory factor and could be exacerbated by increased sea temperatures (Evans and Bjørge 2013). In addition, sea level rise and an increase in storm frequency and associated wave surges could affect the availability of haul out sites for seals. Increased storm frequency and associated conditions could also lead to increased pup and calf mortality.

11.6.14 In conclusion, it is likely that if the proposed development was not developed, the baseline with regard to marine mammal receptors is anticipated to remain unchanged aside from some natural variation (e.g. climate change).

11.7 Basis for ES assessment

Maximum design scenario

11.7.1 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 DCO Application. The assessment of the maximum adverse 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 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)) to that assessed within this Chapter be taken forward in the final scheme design.

11.7.2 The maximum parameters and assessment assumptions that have been identified to be relevant to marine mammals are outlined in **Table 11-13** and are in line with the Project Design Envelope (in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)).

Table 11-13 Maximum parameters and assessment assumptions for impacts on marine mammals

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Construction			
Construction noise impacts (including PTS, TTS and disturbance)	**WTG foundation installation:** 90 of the smaller WTGs supported on either 90 monopile foundations or 360 pin pile foundations (assuming 4 legs per multileg). 12 months duration **Non-piling noise from seabed preparation, rock dumping and cable installation:** Methods: Trenching, dredging, jetting, ploughing, mass flow excavation, vertical injection, rock cutting **Export cable installation:** Total length of export cables: 170km	**Offshore substation foundation installation:** 3 substation structures supported on either 3 monopile foundations or ~~18~~ 36 pin pile foundations (assuming 6 legs per multileg) 12 months duration **Maximum spatial design scenario:** ~~4~~2 monopiles per day - simultaneous installation based on 2 monopile foundations installed sequentially at the West and East locations = 23 ~~45~~ days piling 8 ~~4~~ pin piles per day - simultaneous installation	The use of the smaller WTGs over the larger WTGs results in a greater number of WTGs being installed. As the hammer energy is the same for either WTG size, the smaller WTGs represent the maximum amount of energy emitted into the marine environment and therefore the largest risk to marine mammals. Both foundation types (MP and PP) are presented here as while the hammer energy is higher for MPs, the additional number of PPs required may result in a greater impact due to the longer installation period. In terms of concurrent piling the worst-case scenario is from concurrent monopiling at the W and E locations as these are the furthest apart. Concurrent piling of monopile and multileg foundations will have a smaller impact range than concurrent piling of 2 monopiles. This is the maximum potential for underwater noise impacts.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		based on 2 ~~piles~~multileg foundations installed sequentially at the West and East locations (assuming 4 legs per multileg) = 45 days piling **WTG foundation installation:** 7.5 minute soft start 22.5 minute ramp up (30 minutes total) **Monopile foundations;** hammer energy of up to 4,400kJ **Pin pile foundations;** hammer energy of up to 2,500kJ **Maximum temporal design scenario:** 90 WTGs on monopile foundations	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Up to 3 offshore substations Total of 93 monopiles in the array = 93 piling days 90 WTGs on piled multileg foundations = 360 pin piles Up to 3 offshore substations = 36 pin piles Total of 396 pin piles in the array = 99 piling days **WTG foundation installation:** A maximum of 25 vessels making up to 680 return trips. **Offshore substation installation:** 7.5 minute soft-start 22.5 minute ramp up	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Vessel collision risk	N/A : .	**WTG foundation installation:** A maximum of 25 vessels making up to 680 return trips. **WTG installation** A maximum of 22 vessels making up to 1,033 return trips. **Offshore substation installation** A maximum of 37 vessels making up to 288 return trips. **Export cable installation** A maximum of 24 vessels making up to 154 return trips. **Array cable installation** A maximum of 21 vessels making up to 318 return trips.	The maximum number of WTGs and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel round trips. The maximum number of vessels transits and the maximum duration of the construction will result in the greatest potential for vessel collisions with marine mammals

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Vessel disturbance	This is considered as per the justification for 'Vessel collision risk' (construction – see above).	As listed above in vessel collision risk	The maximum number of WTGs and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel round trips. The maximum number of vessels transits and the maximum duration of the construction will result in the greatest potential for marine mammal disturbance.
Changes in prey availability	The assessment for this impact is based on the MDS presented in **Chapter 8: Fish and shellfish Ecology, Volume 2** of the ES (Document Reference: 6.2.8)**.** See that chapter for a full description of the MDS	Please see **Chapter 8: Fish and Shellfish Ecology, Volume 2** of the ES (Document Reference: 6.2.8) for maximum assessment assumptions that impact fish and shellfish species.	The MDS described in **Chapter 8: Fish and Shellfish Ecology, Volume 2** of the ES (Document Reference: 6.2.8) is considered to be an accurate assessment. Therefore this chapter bases its assessment of the reduction in prey availability on the information presented within that chapter
Disturbance to seal haul out sites at landfall	This is considered as per the justification for 'Construction noise impacts (including PTS and disturbance)', 'Vessel collision risk', 'Vessel disturbance' and 'Reduction in prey	See above for assessment assumptions that will influence disturbance	All construction activities may potentially cause disturbance to seal haul out sites at landfall and therefore the MDS should consider all the other impacts

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	availability' (construction – see above).		
Operation and maintenance			
Operational noise impacts	**WTG** Use of the larger WTGs **Diameter of monopile:** 13.5m	**Total number of structures:** Up to 65 **Seabed take of foundation alone:** 143m^2 **Seabed area total – per turbine:** 3,580m^2 **Jack-up area per leg:** 250 m^2 **Jack–up number of legs:** 6	The use of the larger WTGs is likely to result in the loudest noise from operational WTGs.
Vessel collision risk	869 total return trips for all vessel types per year. **Peak vessel quantities:** A maximum of 21 vessels at any one time**.**	**Offshore activities:** CTVs: 6 SOVs: 2 JUVs: 4	The maximum number of WTGs and associated infrastructure will lead to the highest level of WTGs and associated maintenance activities and therefore highest level of maintenance vessel round trips. The maximum number of vessels transits and the maximum duration of the

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Operation and maintenance vessel peak quantities: Large vessels: 3 Small vessels: 6 Lift vessels: 2 Cable maintenance vessels: 2 Auxiliary vessels: 8	maintenance will result in the greatest potential for vessel collisions with marine mammals.
Vessel disturbance	This is considered as per the justification for 'Vessel collision risk' (operation and maintenance – see above).	As listed above in vessel collision risk	The maximum number of WTGs and associated infrastructure will lead to the highest level of WTGs and associated maintenance activities and therefore highest level of maintenance vessel round trips. The maximum number of vessels transits and the maximum duration of the maintenance will result in the greatest potential for marine mammal disturbance.
Decommissioning			

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Decommissioning noise impacts (including PTS and disturbance)	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for marine mammals are considered analogous with those assessed for the construction phase. Therefore, this is considered as per the justification for 'Construction noise impacts (including PTS and disturbance)' (see above).		The scenario which represents the potential for the maximum level of infrastructure to be decommissioned. Decommissioning is likely to include removal of all of the WTG components and part of the foundations (those above seabed level) and removal of all other surface infrastructure. Some or all of the array cables, interconnector cables, and offshore export cables may be removed. The implications of decommissioning on marine mammals are expected to be less than the construction phase and are therefore not considered to be significant.
Vessel collision risk	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for marine mammals are considered analogous with those assessed for the construction phase. Therefore, this is considered as per the justification for 'Vessel collision risk' (construction – see above).		The scenario which represents the potential for the maximum level of infrastructure to be decommissioned (see above).
Vessel disturbance	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for marine mammals are considered analogous with those assessed for the construction		The scenario which represents the potential for the maximum level of infrastructure to be decommissioned (see above).

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	phase. Therefore, this is considered as per the justification for 'Vessel disturbance' (construction – see above).		
Changes in prey availability	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for marine mammals are considered analogous with those assessed for the construction phase. Therefore, this is considered as per the justification for 'Reduction in prey availability' (construction – see above).		The scenario which represents the potential for the maximum level of infrastructure to be decommissioned (see above).
Disturbance to seal haul outs at landfall	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for marine mammals are considered analogous with those assessed for the construction phase. Therefore, this is considered as per the justification for 'Disturbance to seal haul outs at landfall' (construction – see above).		The scenario which represents the potential for the maximum level of infrastructure to be decommissioned (see above).

Embedded environmental measures

11.7.3 As part of the Rampion 2 design process, a number of embedded environmental measures have been adopted to reduce the potential for impacts on marine mammals. These embedded environmental measures have evolved over the development process as the EIA has progressed and in response to consultation.

11.7.4 These measures also include those that have been identified as good or standard practice and include actions that will be undertaken to meet existing legislation requirements. As there is a commitment to implementing these embedded environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of Rampion 2 and are set out in this ES.

11.7.5 **Table 11-14** sets out the relevant embedded environmental measures within the design and how these affect the marine mammal assessment.

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Table 11-14 Relevant marine mammals embedded environmental measures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to marine mammals' assessment
C-51	A Vessel Management Plan will be developed pre-construction which will determine vessel routeing to and from construction areas and ports to minimise, as far as reasonably practicable, encounters with marine mammals. It will also consider vessel codes of conduct provided by WiSe Scheme, Scottish Marine Wildlife Watching Code (MWWC) and the Nature Scott "Guide to best practice for watching marine wildlife".	Scoping, updated at ES	DCO requirements or dML conditions	The VMP will reduce the risk of vessel disturbance and collision risk. The assessment of vessel disturbance and collision risk are assessed in **Sections 11.9, 11.10** and **11.11**.
C-52	A piling Marine Mammal Mitigation Protocol (MMMP) will be implemented during construction and will be developed in accordance with Joint Nature Conservation Committee (JNCC, 2010) guidance and with the latest relevant guidance and information and in consultation with stakeholders. The piling MMMP will include details of soft starts to be used during piling operations with lower hammer energies	Scoping – updated at PEIR and ES	DCO requirements or dML conditions	The piling MMMP will reduce the impact of underwater noise generated from piling activities, lowering the risk of injury, including PTS.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to marine mammals' assessment
	used at the beginning of the piling sequence before increasing energies to higher levels. A **Draft Piling Marine Mammal Protocol** (Document Reference: 7.14) has been submitted with this application.			
C-53	An Outline Marine Pollution Contingency Plan (MPCP) has been submitted with this Application as Appendix A of the **Outline Project Environmental Management Plan** (Document Reference: 7.11). This Outline MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Rampion 2. The Final MPCP will include relevant key emergency contact details.	Scoping, updated at ES	DCO requirements or dML conditions	The MPCP will reduce the risk of an accidental pollution event occurring.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to marine mammals' assessment
C-54	A Decommissioning Marine Mammal Mitigation Protocol (MMMP) will be implemented during decommissioning. The Decommissioning MMMP will be in line with the latest relevant available guidance.	Scoping, updated at ES	DCO requirements or dML conditions	The decommissioning MMMP will reduce the impact from underwater noise generated from decommissioning activities, lowering the risk of injury, including PTS.
C-95	The assessment has taken into consideration the mitigation and control of invasive species measures, this has been incorporated into the **Outline Project Environmental Management Plan** (PEMP) (Document Reference: 7.11).	Scoping	DCO requirement or dML conditions	The Outline PEMMP will summarise the mitigation measures and monitoring requirements for marine mammals and assist in reducing impacts from the development.
C-102	UXO Clearance Marine Mammal Mitigation Protocol (MMMP) will be developed in consultation with Natural England to appropriately manage the risk to marine mammals during UXO clearance. A **Draft UXO Clearance MMMP** (Document Reference: 7.15) has been submitted with this Application.	Scoping, updated at ES	Application for UXO clearance works Marine Licence	The UXO MMMP will reduce the impact of underwater noise generated from the removal of UXOs, lowering the risk of injury, including PTS.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to marine mammals' assessment
C-265	At least one offshore pilling noise mitigation technology will be utilised to deliver underwater noise attenuation in order to reduce predicted impacts to sensitive receptors at relevant Marine Conservation Zone (MCZ) sites and avoid the potential for significant residual effects on these features.	ES	dML conditions	Although the commitment is specific to MCZ, which are not designated for marine mammal features, C-265 is relevant to marine mammals as the use of mitigation technologies will reduce the impact of underwater noise generated from piling during construction phase, this will lower the risk of injury, including PTS.
C-275	The use of low order detonations to dispose of Offshore UXOs using the 'deflagration method' will be implemented, where practicable.	ES	dML conditions	The use of low order detonations will secure a reductio in the impact from underwear noise generated from UXO clearance, lowering the risk of injury, including PTS.

11.7.6 Further detail on the environmental measures in **Table 11-14** is provided in the **Commitments Register** (Document Reference: 7.22) which sets out how and where particular environmental measures will be implemented and secured.

11.8 Methodology for ES assessment

Introduction

11.8.1 The project-wide generic approach to assessment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5). The assessment methodology for marine mammals for the ES is consistent with that provided in the Scoping Report (RED, 2020) and no changes have been made since the Scoping phase and PEIR.

Impact assessment criteria

11.8.2 The approach to determining the significance of effect is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts.

11.8.3 The criteria for defining sensitivity in this chapter are outlined in **Table 11-15** below. These criteria have been updated and redefined since publication of the PEIR (see **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2)), with changes being followed through to reflect this in this chapter.

Table 11-15 Definition of terms relating to receptor sensitivity

Sensitivity	Definition used in this chapter
High	No ability to adapt behaviour so that individual vital rates (survival and reproduction) are highly likely to be significantly affected. No tolerance – Effect will cause a change in individual vital rates (reproduction and survival rates). No ability for the animal to recover from any impact on vital rates (reproduction and survival rates).
Medium	Limited ability to adapt behaviour so that individual vital rates (survival and reproduction) may be significantly affected. Limited tolerance – Effect may cause a change in individual vital rates (reproduction and survival). Limited ability for the animal to recover from any impact on vital rates (reproduction and survival rates).

Sensitivity	Definition used in this chapter
Low	Ability to adapt behaviour so that individual vital rates (survival and reproduction rates may be affected but not at a significant level. Some tolerance – No significant change in individual vital rates (survival and reproduction). Ability for the animal to recover from any impact on vital rates (reproduction and survival rates).
Very low	Receptor is able to adapt behaviour so that individual vital rates (survival and reproduction) are not affected. Receptor is able to tolerate the effect without any impact on individual vital rates (survival and reproduction). Receptor is able to return to previous behavioural states/activities once the impact has ceased.

11.8.4 The criteria for defining magnitude in this chapter are outlined in **Table 11-16** below

Table 11-16 Definition of terms relating to a magnitude of an impact

Magnitude of impact	Definition used in this chapter
High	The impact would affect the behaviour and distribution of sufficient numbers of individuals, with sufficient severity, to affect the favourable conservation status and/or the long-term viability of the population at a generational scale. (Adverse)
	Impact is expected to result in a long-term, large-scale increase in the population trajectory at a generational scale. (Beneficial)
Medium	Temporary changes in behaviour and/or distribution of individuals at a scale that will result in potential reductions to lifetime reproductive success to some individuals although not enough to affect the population trajectory over a generational scale. Permanent effects on individuals that may influence individual survival but not at a level that will alter population trajectory over a generational scale. (Adverse)
	Benefit to the habitat influencing foraging efficiency resulting in increased reproductive potential and increased population health and size. (Beneficial)

Magnitude of impact	Definition used in this chapter
Low	Short-term and/or intermittent and temporary behavioural effects in a small proportion of the population. Reproductive rates of individuals may be impacted in the short term (over a limited number of breeding cycles). Survival and reproductive rates very unlikely to be impacted to the extent that the population trajectory will be altered. (Adverse)
	Short term (over a limited number of breeding cycles) benefit to the habitat influencing foraging efficiency resulting in increased reproductive potential. (Beneficial)
Very Low	Very short term, recoverable effect on the behaviour and/or distribution in a very small proportion of the population. No potential for the any changes in the individual reproductive success or survival therefore no changes to the population size or trajectory. (Adverse)
	Very minor benefit to the habitat influencing foraging efficiency of a limited number of individuals. (Beneficial)

11.8.5 The significance of the effect upon marine mammals is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in **Table 11-17**. Where a range of significance of effect is presented in **Table 11-17**, the final assessment for each effect is based upon expert judgement.

Table 11-17 Matrix used for the assessment of the significance of the effect

Sensitivity/	Magnitude of Impact: High	Medium	Low	Very low
High	Major (Significant)	Major (Significant)	Moderate (Potentially significant)	Minor (Not significant)
Medium	Major (Significant)	Moderate (Potentially significant)	Minor (Not significant)	Minor (Not significant)
Low	Moderate (Potentially significant)	Minor (Not significant)	Minor (Not significant)	Negligible (Not significant)
Very low	Minor (Not significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)

11.9 Assessment of effects: Construction phase

Introduction

11.9.1 The impacts of the construction of the Proposed Development have been assessed on marine mammals in the study area. The effects arising from the construction of the Proposed Development are listed in **Table 11-13** along with the maximum design scenario assumptions against which each construction phase impact has been assessed.

11.9.2 A description of the significance of effects upon marine mammal receptors caused by each identified impact is given below.

Construction noise impacts (including PTS, TTS and disturbance)

Overview

11.9.3 Construction activities, particularly pile driving, result in high levels of underwater noise emitted into the marine environment. Different sources result in different types and intensities of underwater noise, with pile driving and UXO clearance causing impulsive noise, resulting in the highest intensity sound likely to be emitted as part of the construction phase. Other sound sources such as vessels involved in construction and noise arising from cable installation or other construction activities are typically of a lower intensity, (mainly) non-impulsive nature and are likely to be continuous sounds, which pose a reduced magnitude of impact to marine mammals compared to piling and UXO.

11.9.4 Due to the expected duration and intensity of the underwater noise from piling compared to the other sound sources, the focus of the potential effects from underwater noise presented below focuses on that from piling, with consideration of the potential impacts from other sources provided following the piling assessment.

11.9.5 To inform the assessment of impacts from underwater noise, modelling has been undertaken which details the expected sound levels and predicted impact ranges (for relevant thresholds) from the various sound sources. Four representative locations were modelled: the North West (NW) location is in shallow water and close to the coast, the South (S) location is in the deepest water of the site, and the East (E) and West (W) locations were selected for the maximum separation distance for concurrent piling activities. The modelling methodology and results are presented within **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2).

Piling noise assessment

Overview

11.9.6 A detailed underwater noise impact assessment of the effects which may arise from underwater noise from piling on marine mammals is presented in **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2) with the information below a summary of the information provided therein.

11.9.7 Both a WCS (worst case scenario) and a MLS (most likely scenario) for both monopiles and pin-piles are presented to cover the absolute maximum piling parameters that would ever be required to install a foundation (in terms of maximal hammer energies and longest piling durations) alongside the piling parameters that are considered to be more representative of the majority of the piling activity across the site.

PTS

11.9.8 Under the WCS, the largest predicted cumulative PTS-onset impact range for harbour porpoises is 7.4 km, resulting in a potential PTS-onset impact to 26 harbour porpoise per piling day, which represents 0.007% of the North Sea MU (**Table 11-18**). Under the MLS, the largest predicted cumulative PTS-onset impact range is 6.9 km, resulting in a potential PTS-onset impact to 23 harbour porpoise per piling day, which represents 0.007% of the North Sea MU (**Table 11-19**).

Table 11-18 Impact area, maximum range, number of harbour porpoise and percentage of MU predicted to experience PTS-onset for the WCS

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous PTS: 202 dB unweighted SPL_{peak}								
Area (km^2)	0.57	0.91	1.4	1.4	0.38	0.63	0.99	0.93
Max range (km)	0.43	0.55	0.68	0.66	0.36	0.46	0.56	0.55
# Porpoise	<1	<1	<1	<1	<1	<1	<1	<1
% MU	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cumulative PTS: 155 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	6.9	20	120	87	2.8	10	77	54
Max range (km)	2.2	3.8	7.4	6.9	1.5	2.8	5.9	5.4
# Porpoise	1	2	26	19	1	2	16	12
% MU	0.000	0.000	0.007	0.005	0.000	0.000	0.004	0.003

Table 11-19 Impact area, maximum range, number of harbour porpoise and percentage of MU predicted to experience PTS-onset for the MLS

	Monopile (4,000 kJ)				Pin-pile (2,000 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous PTS: 202 dB unweighted SPL_{peak}								
Area (km^2)	0.54	0.87	1.4	1.3	0.33	0.53	0.82	0.77

	Monopile (4,000 kJ)				Pin-pile (2,000 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Max range (km)	0.42	0.54	0.67	0.65	0.33	0.42	0.51	0.50
# Porpoise	<1	<1	<1	<1	<1	<1	<1	<1
% MU	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cumulative PTS: 155 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	6	17	110	78	1.5	6.5	57	40
Max range (km)	2.1	3.4	6.9	6.5	1.1	2.2	5.0	4.6
# Porpoise	1	4	23	17	<1	1	12	9
% MU	0.000	0.001	0.007	0.004	0.000	0.000	0.003	0.002

Under the WCS, the largest predicted cumulative PTS-onset impact range for bottlenose and common dolphins is <0.1 km, resulting in a potential PTS-onset impact to <1 individual dolphin per piling day, which represents 0.000% of the MUs for each species (**Table 11-20**).

Table 11-20 Impact area, maximum range and number of bottlenose and common dolphins predicted to experience PTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous PTS: 230 dB unweighted SPL_{peak}								
Area (km^2)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Max range (km)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bottlenose dolphins	<1	<1	<1	<1	<1	<1	<1	<1

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Common dolphins	<1	<1	<1	<1	<1	<1	<1	<1
Cumulative PTS: 185 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Max range (km)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
# **Bottlenose dolphins**	<1	<1	<1	<1	<1	<1	<1	<1
# **Common dolphins**	<1	<1	<1	<1	<1	<1	<1	<1

11.9.9 The largest predicted cumulative PTS-onset impact range for minke whales is 15 km under the WCS. Despite these large PTS-onset impact ranges, the density of minke whales predicted to be in this area is low enough (0.002 whales/km^2 SCANS III) that even with impact ranges of this scale, there is only a potential PTS-onset impact to ≤1 individual whale per piling day, which represents 0.000% of the MU (**Table 11-21**).

Table 11-21 Impact area, maximum range and number of minke whales predicted to experience PTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous PTS: 219 dB unweighted SPL_{peak}								
Area (km^2)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Max range (km)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
# **whales**	<1	<1	<1	<1	<1	<1	<1	<1
% MU	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Cumulative PTS: 183 dB VHF Weighted SEL_{cum} (~~2 monopiles or 4 pin-~~multiple piles in 24 hrs)								
Area (km^2)	8.6	43	380	280	2.2	21	280	190
Max range (km)	3.2	7.2	15	14	1.7	5.3	13	12
# whales	<1	<1	1	1	<1	1	<1	<1
% MU	<0.004	<0.004	0.004	0.004	<0.004	<0.004	0.004	<0.004

11.9.10 Under the WCS, the largest predicted PTS-onset impact range for harbour and grey seals is 0.06 km, resulting in a potential PTS-onset impact to <1 individual harbour or grey seal per piling day (**Table 11-22**).

Table 11-22 Impact area, maximum range and number of harbour and grey seals predicted to experience PTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous PTS: 218 dB unweighted SPL_{peak}								
Area (km^2)	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Max range (km)	<0.05	<0.05	0.06	0.05	<0.05	<0.05	<0.05	<0.05
# Harbour seals	<1	<1	<1	<1	<1	<1	<1	<1
# Grey seals	<1	<1	<1	<1	<1	<1	<1	<1
Cumulative PTS: 185 dB VHF Weighted SEL_{cum} (~~2 monopiles or 4 pin~~multiple ~~-~~piles in 24 hrs)								
Area (km^2)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Max range (km)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
# Harbour seals	<1	<1	<1	<1	<1	<1	<1	<1
# Grey seals	<1	<1	<1	<1	<1	<1	<1	<1

11.9.11 Although the numbers of individuals predicted to be at risk per piling day for all species are low enough to not be considered significant in EIA terms, all cetaceans assessed are EPS and under EPS legislation it is an offence to injure a single individual (including PTS auditory injury). Therefore, RED have produced a **Draft Piling MMMP** (Document Reference: 7.14) (C-52, **Table 11-14**) with the aim of reducing the risk of PTS to as low as reasonably possible. Therefore, the magnitude of PTS from pile driving has been assessed as **Negligible** for all marine mammal species.

TTS

11.9.12 The ranges that indicate TTS-onset were modelled and are presented alongside an estimate of the potential number of animals within these impact ranges. However, as TTS-onset is defined primarily as a means of predicting PTS-onset, there is currently no threshold for TTS-onset that would indicate a biologically significant amount of TTS; therefore it was not possible to carry out a quantitative assessment of the magnitude or significance of the impact of TTS on marine mammals and therefore TTS is not considered during the assessment stage of this ES. The current set of TTS-onset threshold will result in a significant overestimate of the impact due to the extremely large resulting impact ranges representing the smallest measurable amount of TTS. This approach was agreed with the CEFAS at the ETG meeting dated 18 September 2020 and by Natural England at the ETG meeting dated 13 October 2020.

11.9.13 **Table 11-23** outlines the potential for TTS-onset for harbour porpoise for both monopiles and pin-piles under the WCS. The largest predicted cumulative TTS-onset impact range is 34 km, resulting in a potential TTS-onset impact to 383 harbour porpoise per piling day which represents 0.11% of the North Sea MU.

Table 11-23 Impact area, maximum range, number of harbour porpoise and percentage of MU predicted to experience TTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous TTS: 196 dB unweighted SPL_{peak}								
Area (km^2)	2.8	4.6	8.7	8.1	2.0	3.3	6.1	5.6
Max range (km)	0.97	1.3	1.7	1.6	0.81	1.1	1.7	1.4
# Porpoise	<1	1	2	2	<1	<1	1	1
% MU	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cumulative TTS: 140 dB VHF Weighted SEL_{cum} (~~2 monopiles or 4 p~~multiple ~~in-~~piles in 24 hrs)								
Area (km^2)	550	720	1800	1500	440	600	1600	1300
Max range (km)	21	24	34	33	19	22	31	30
# Porpoise	117	153	383	320	94	138	341	277
% MU	0.03	0.04	0.11	0.09	0.03	0.04	0.10	0.08

11.9.14 **Table 11-24** outlines the potential for TTS-onset for bottlenose and common dolphins for both monopiles and pin-piles under the WCS. The largest predicted cumulative TTS-onset impact range is <0.1 km, resulting in a potential TTS-onset impact to <1 individual dolphin of each species per piling day which represents 0.000% of the relevant MU for each species. Given the low numbers predicted for the WCS.

Table 11-24 Impact area, maximum range, number of bottlenose and common dolphins and predicted to experience TTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous TTS: 224 dB unweighted SPL_{peak}								
Area (km^2)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Max range (km)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
# **Bottlenose dolphins**	<1	<1	<1	<1	<1	<1	<1	<1
# **Common dolphins**	<1	<1	<1	<1	<1	<1	<1	<1
Cumulative TTS: 170 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Max range (km)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
# **Bottlenose dolphins**	<1	<1	<1	<1	<1	<1	<1	<1
# **Common dolphins**	<1	<1	<1	<1	<1	<1	<1	<1

11.9.15 **Table 11-25** outlines the potential for TTS-onset for minke whales for both monopiles and pin-piles under the WCS. The largest predicted cumulative TTS-onset impact range is 46 km, resulting in a potential TTS-onset impact to five whales per piling day which represents 0.031% of the relevant MU.

Table 11-25 Impact area, maximum range, number of minke whales and percentage of MU predicted to experience TTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous TTS: 213 dB unweighted SPL_{peak}								
Area (km^2)	0.02	0.03	0.05	0.04	0.02	0.02	0.03	0.03
Max range (km)	0.09	0.11	0.12	0.12	0.07	0.08	0.10	0.10
# whales	<1	<1	<1	<1	<1	<1	<1	<1
% MU	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cumulative TTS: 168 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	730	1100	2700	2300	530	830	2400	2000
Max range (km)	26	31	46	44	23	28	43	41
# whales	2	3	6	5	1	2	6	5
% MU	0.01	0.01	0.03	0.02	0.00	0.01	0.03	0.02

11.9.16 **Table 11-26** outline the potential for TTS-onset for harbour and grey seals for both monopiles and pin-piles under the WCS. The largest predicted cumulative TTS-onset impact range is 16km, resulting in a potential TTS-onset impact to <1 seal of each species per piling day.

Table 11-26 Impact area, maximum range, number of harbour and grey seals predicted to experience TTS-onset for the WCS.

	Monopile (4,400 kJ)				Pin-pile (2,500 kJ)			
	NW	**W**	**S**	**E**	**NW**	**W**	**S**	**E**
Instantaneous TTS: 212 dB unweighted SPL_{peak}								
Area (km^2)	0.03	0.05	0.06	0.06	0.02	0.03	0.04	0.04
Max range (km)	0.10	0.12	0.14	0.14	0.08	0.10	0.12	0.11
# Harbour seals	<1	<1	<1	<1	<1	<1	<1	<1
# Grey seals	<1	<1	<1	<1	<1	<1	<1	<1
Cumulative TTS: 170 dB VHF Weighted SEL_{cum} (multiple ~~2 monopiles or 4 pin-~~piles in 24 hrs)								
Area (km^2)	36	92	470	360	26	75	410	310
Max range (km)	5.3	8.9	16.0	15.0	4.6	8.0	15.0	14.0
# Harbour seals	<1	<1	<1	<1	<1	<1	<1	<1
# Grey seals	<1	<1	<1	<1	<1	<1	<1	<1

Disturbance

11.9.17 **Table 11-27** summarises the number of individuals and the percentage of MUs for all species predicted to experience potential disturbance for the WCS and MLS.

11.9.18 Under the WCS for monopiles, a total of 752 harbour porpoises are predicted to be potentially disturbed at the south location once hammer energy reaches its maximum, which represents 0.21% of the MU. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of 743 harbour porpoises are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.21% of the MU. Under the WCS for pin piles, 652 harbour porpoises are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.19% of the MU at the worst-case south location (**Figure 11-3, Volume 3** of the ES (Document Reference: 6.3.11)). For the concurrent piling of pin-piles at the west and east locations simultaneously, a total of 670 harbour porpoises are predicted to be disturbed once hammer energy reaches the maximum, which represents 0.19% of the MU. Given the results of the expert elicitation on the likely effects of behavioural disturbance on

vital rates (Booth *et al.,* 2019), a total of 45 days piling for monopiles (assuming two monopiles are installed concurrently) and 99 days piling for pin-piles (assuming four piles per day) is unlikely to cause any effect on fertility rates, although there is the potential for calf survival to be affected. However, it is highly unlikely that the same mother-calf pair would repeatedly return to the area in order to receive these levels of repeated disturbance over this many days. The extent of the impact in terms of the number of animals affected, the proportion of the MU affected, and the duration of impact is low. The magnitude is therefore considered to be **Low**.

11.9.19 Under the WCS for monopiles, a total of 126 bottlenose dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 1.15% of the MU. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of 129 bottlenose dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 1.18% of the MU. Under the WCS for pin piles, 113 bottlenose dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 1.03% of the MU. For the concurrent piling of pin-piles at the west and east locations simultaneously, a total of 116 bottlenose dolphins are predicted to be disturbed once hammer energy reaches the maximum, which represents 1.06% of the MU. The number of bottlenose dolphins predicted to experience behavioural disturbance as a result of pile-driving is considered to be conservative, due to the fact that the density estimate used (0.037 dolphins/km^2) is the summer density estimate for the English Channel. Densities are expected to be much lower in the winter (0.010 dolphins/km^2) and therefore the numbers used for this assessment are highly precautionary for the predicted level of impact in winter months. The proportion of the population predicted to be impacted by the Proposed Development and the number of days of piling expected to occur is highly unlikely to result in any decline in the bottlenose dolphin population. Therefore, the magnitude is considered to be **Low**.

11.9.20 Under the WCS for monopiles, a total of 582 common dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.57% of the MU. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of 597 common dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.58% of the MU. Under the WCS for pin piles, 524 common dolphins are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.51% of the MU. For the concurrent 538 common dolphins are predicted to be disturbed once hammer energy reaches the maximum, which represents 0.52% of the MU. Given the number of dolphins predicted to be impacted and the proportion of the population this represents, the magnitude is considered to be **Low**.

11.9.21 Under the WCS for monopiles, a total of eight minke whales are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.04% of the MU. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of eight minke whales are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.04% of the MU. Under the WCS for pin piles, seven minke whales are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.03% of the MU. For the concurrent piling of pin-piles at the west and

east locations simultaneously, a total of seven minke whales are predicted to be disturbed once hammer energy reaches the maximum, which represents 0.03% of the MU. Given the low density of minke whales predicted to be in the area, the resulting number of animals and proportion of the population potentially disturbed by pile driving results in a magnitude score of **Low**.

11.9.22 Under the WCS for monopiles, a total of <1 harbour seal is predicted to be potentially disturbed once hammer energy reaches its maximum. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of <1 harbour seal is predicted to be potentially disturbed once hammer energy reaches its maximum. Under the WCS for pin piles, <1 harbour seal is predicted to be potentially disturbed once hammer energy reaches its maximum. The magnitude is therefore considered to be **Very Low**.

11.9.23 Under the WCS for monopiles, a total of one grey seal is predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.003% of the MU. For the concurrent piling of monopiles at the west and east locations simultaneously, a total of two grey seals are predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.004% of the MU. Under the WCS for pin piles, one grey seal is predicted to be potentially disturbed once hammer energy reaches its maximum, which represents 0.003% of the MU. The magnitude is therefore considered to be **Very Low**.

Table 11-27 Number of individuals and percentage of MUs for all species predicted to experience potential disturbance for the WCS and MLS.

	N	W	E	S	W & E	N	W	E	S	W & E
WCS	**Monopile (4,400 kJ)**					**Pin-pile (2,500 kJ)**				
# Harbour porpoise	285	360	626	752	743	243	313	561	652	670
% MU	0.08	0.10	0.18	0.21	0.21	0.07	0.09	0.16	0.19	0.19
# Bottlenose dolphin	50	62	109	126	129	42	54	97	113	116
% MU	0.46	0.57	1.00	1.15	1.18	0.38	0.49	0.89	1.03	1.06
# Common dolphins	229	289	503	582	597	195	251	450	524	538
% MU	0.22	0.28	0.49	0.57	0.58	0.19	0.24	0.44	0.51	0.52
# Minke whale	3	4	7	8	8	3	3	6	7	7
% MU	0.01	0.02	0.03	0.04	0.04	0.01	0.01	0.03	0.03	0.03
# Harbour seal	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
# Grey seal	<1 (0-<1)	<1 (0-<1)	1 (0-2)	1 (0-2)	2 (0-3)	<1 (0-1)	<1 (0-<1)	1 (0-2)	<1 (0-1)	1 (0-2)
MLS	**Monopile (4,000 kJ)**					**Pin-pile (2,000 kJ)**				
# Harbour porpoise	280	354	618	716	734	229	296	534	622	641
% MU	0.08	0.10	0.18	0.21	0.21	0.07	0.09	0.15	0.18	0.19
# Bottlenose dolphin	49	61	107	124	128	40	51	93	108	111

	N	W	E	S	W & E	N	W	E	S	W & E
% MU	0.45	0.56	0.98	1.13	1.17	0.37	0.47	0.85	0.99	1.01
# Common dolphins	225	284	496	574	589	184	238	429	499	515
% MU	0.22	0.28	0.48	0.56	0.57	0.18	0.23	0.42	0.49	0.50
# Minke whale	3	4	7	8	8	2	3	6	7	7
% MU	0.01	0.02	0.03	0.04	0.04	0.01	0.01	0.03	0.03	0.03

Magnitude of impact

11.9.24 The impact in each case is predicted to be of local spatial extent, short term duration, intermittent and is reversible. The Applicant considers that piling is short term (for the Proposed Development alone assessment), given the likely number of piling days within the construction period and the fact that piling will not be constant on or between piling days. There is evidence that marine mammals return to the vicinity of construction and that any disturbance effect is short lived (e.g. Brandt *et al.,* (2018) showed that porpoise detections returned to normal within 24-48 hours after piling ceased), therefore pile driving is not considered to be a long-term impact.

11.9.25 The magnitude of PTS and disturbance for each species is presented in **Table 11-28** and **Table 11-29**. The implementation of the **Draft Piling MMMP** (Document Reference: 7.14) (C-52, **Table 11-14**) results in the magnitude of PTS being **Negligible** for all species.

11.9.26 For disturbance, the magnitude varies between species with the highest magnitude being considered as **Low** the cetacean species and **Very Low** for the pinniped species.

Sensitivity or value of receptor

11.9.27 As outlined in **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2) the potential for PTS resulting from exposure to pile driving noise to affect the survival and reproduction of individuals is considered **Low** for all marine mammal species.

11.9.28 As outlined in **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2) cetacean species and harbour seals are considered to have a **Low** sensitivity to disturbance from pile driving noise, and grey seals are considered to have a **Very Low** sensitivity.

Significance of residual effect

11.9.29 The impact of behavioural disturbance and PTS from piling noise under both the WCS is not considered to have a significant effect on any marine mammal species considered in this assessment (**Table 11-28** and **Table 11-29**).

Table 11-28 Impact significance for all marine mammals to the impact of PTS from impact piling

	Monopiles & Pin-piles (worst case scenario)		
	Magnitude (given piling MMMP)	**Sensitivity**	**Impact**
Harbour porpoise	Negligible	Low	Negligible (not significant)
Bottlenose dolphin	Negligible	Low	Negligible (not significant)
Common dolphin	Negligible	Low	Negligible (not significant)
Minke whale	Negligible	Low	Negligible (not significant)
Harbour seal	Negligible	Low	Negligible (not significant))
Grey seal	Negligible	Low	Negligible (not significant)

Table 11-29 Impact significance for all marine mammals to the impact of behavioural disturbance from impact piling.

	Monopiles & Pin-piles (worst case scenario)		
	Magnitude	**Sensitivity**	**Impact**
Harbour porpoise	Low	Low	Minor (Not Significant)
Bottlenose dolphin	Low	Low	Minor (Not Significant)
Common dolphin	Low	Low	Minor (Not Significant)
Minke whale	Low	Low	Minor (Not Significant)
Harbour seal	Very low	Low	Negligible (Not Significant)
Grey seal	Very low	Very low	Negligible (Not Significant)

UXO noise assessment

Overview

11.9.30 Clearance of UXO, if any are located prior to the construction of the proposed development, will be necessary to reduce the risk to personnel and equipment during the construction process. RED is proposing to consent UXO clearance (if required) through a separate Marine Licence prior to the works being undertaken to enable a more detailed assessment to be undertaken based on increased data

availability. However, as the clearance of UXO is an activity which is likely to occur, for completeness it has been considered within this assessment and under commitment 102 (C-102, **Table 11-14**).

11.9.31 Due to the early stage of the Proposed Development and the consequent lack of detailed site-specific magnetometer data, it is not currently possible to define the number (if any) of UXO which may require clearance prior to the start of construction. Therefore, the assessment below presents potential impact ranges from a variety of charge sizes that may be found within the proposed DCO Order Limits. Previously in the area, two UXOs were found during the construction of Rampion 1 Offshore Wind Farm, in the offshore cable route area and were disposed of in 2016. Additionally, in 2020 RTE issued contract notices for UXO surveys to take place for the Fécamp Offshore Wind Farm and Couseulles-sur-Mer Offshore Wind Farm, both situated off the Normandy coast and in the pre-construction phase.

11.9.32 The UXO clearance operations will follow the avoid, reduce, mitigate process, with first intention being to avoid the need to detonate the UXO by micrositing infrastructure. In many instances, this will not be possible and therefore, for clearance operations, two primary types of clearance will be considered:

- High order - this comprises using a donor charge of explosive (typically between–5 - 20kg) to trigger a full detonation of the explosive within the UXO; and
- Low order - this comprises using a small amount (up to 2kg) of explosive to burn out the explosive material within the UXO without detonating it (deflagration).

11.9.33 While it is expected that any UXO clearance will be conducted using the low-order clearance method, current advice is that high-order clearance must be assessed as the worst case scenario (Defra *et al.,* 2021). The clearance techniques used at the time will employ industry best practice, with due consideration given to developing technology/techniques which are currently being introduced to the market (i.e. low order techniques). Supporting environmental information submitted with the Application at the time the Marine Licence is sought will set out the proposed approach based on the practicable techniques available and the dependability of the methods at that time. **Table 11-30** below details the expected PTS impact ranges for high order clearance from the potential variety of UXO sizes which may be encountered and the number of individuals impacted.

11.9.34 For the largest UXO size (525kg), the worst-case PTS is range is 13km for harbour porpoise which will impact 36 individuals. For all other species the PTS ranges are smaller for the largest UXO sizes and <1 individual is predicted to experience PTS from UXO clearance.

11.9.35 The risk of PTS effects from UXO will be managed through the development of a **Draft UXO Clearance MMMP** (Document Reference: 7.15) (C-102, **Table 11-14**) which will mitigate impacts from UXO, including consideration of alternative clearance techniques (e.g. low order instead of high) and displacement methods such as Acoustic Deterrent Devices (ADDs) to remove animals from the risk area. A further potential environmental measure for UXO clearance is the use of bubble curtains for high order detonations which will reduce the impact ranges from those

predicted herein (**Table 11-30**). It is likely that by the time the Applicant applies for a UXO Marine Licence, industry knowledge around the contribution of bubble curtains to reducing underwater noise will be further advanced and this knowledge will be incorporated within the assessments and mitigation design if it is decided that this is appropriate (e.g. ongoing Department of Business Enterprise and Industrial Strategy workstream of underwater noise impacts from UXO).

Table 11-30 Summary of the PTS and TTS impact ranges for UXO detonation using the impulsive noise criteria from Southall et al., (2019) for marine mammals

		25 kg	55 kg	120 kg	240 kg	525 kg
Southall *et al.*, (2019) Unweighted SPL_{peak}						
PTS	219 dB (LF)	810 m	1.0 km	1.3 km	1.7 km	2.2 km
	No. PTS	<1	<1	<1	<1	<1
	230 dB (HF)	260 m	340 m	450 m	560 m	730 m
	No. PTS	<1	<1	<1	<1	<1
	202 dB (VHF)	4.6 km	6.0 km	7.7 km	9.8 km	13 km
	No. PTS	5	8	13	21	36
	218 dB (PCW)	900 m	1.1 km	1.5 km	1.9 km	2.5 km
	No. PTS	<1	<1	<1	<1	<1
Southall *et al.*, (2019) Weighted SEL_{ss}						
PTS	183 (LF)	2.1 km	3.2 km	4.6 km	6.5 km	9.5 km
	No. PTS	<1	<1	<1	<1	<1
	185 (HF)	< 50 m	< 50 m	< 50 m	< 50 m	50 m
	No. PTS	<1	<1	<1	<1	<1
	155 (VHF)	560 m	740 m	950 m	1.1 km	1.4 km
	No. PTS	<1	<1	<1	<1	<1
	185 (PCW)	380 m	560 m	830 m	1.1 km	1.6 km
	No. PTS	<1	<1	<1	<1	<1
Southall *et al.*, (2019) Unweighted SPL_{peak}						
TTS	213 dB (LF)	1.5 km	1.9 km	2.5 km	3.2 km	4.1 km

		25 kg	55 kg	120 kg	240 kg	525 kg
	No. TTS	<1	<1	<1	<1	<1
	224 dB (HF)	490 m	640 m	830 m	1.0 km	1.3 km
	No. TTS	<1	<1	<1	<1	<1
	196 dB (VHF)	8.5 km	11 km	14 km	18 km	23 km
	No. TTS	16	26	42	70	113
	212 dB (PCW)	1.6 km	2.1 km	2.8 km	3.5 km	4.6 km
	No. TTS	<1	<1	<1	<1	<1
Southall *et al.*, (2019) Weighted SEL_{ss}						
TTS	168 (LF)	29 km	41 km	57 km	76 km	103 km
	No. TTS	2	4	7	12	22
	170 (HF)	150 m	210 m	300 m	390 m	530 m
	No. TTS	<1	<1	<1	<1	<1
	140 (VHF)	2.4 km	2.8 km	3.2 km	3.5 km	4.0 km
	No.TTS	2	2	3	3	4
	170 (PCW)	5.2 km	7.4 km	11 km	14 km	20 km
	No. TTS	<1	<1	<1	2	3

11.9.36 With respect to potential for disturbance to marine mammals as a result of UXO clearance, in the absence of empirical evidence or agreed metrics, an effective deterrence range of 26km around the source location has been applied here on an assumption of high-order detonation. That range is derived from JNCC advice (JNCC 2020) for application within harbour porpoise SACs to determine the area of significant disturbance from UXO clearance. The 26km radius (area of 2,124 km^2) has been applied here for all species. The resulting number of animals as a proportion of the reference population is detailed in **Table 11-31**. This is quantified by calculating the numbers of animals likely to be within the effective deterrence range by multiplying the area of the impact footprint by the appropriate density estimate.

Table 11-31 Estimated number of marine mammals potentially at risk of disturbance during UXO clearance (assuming an EDR of 26 km, resulting in a 2,123.72km^2 impact area).

Species	Density (no./km^2)	No. Impacted	%MU
Bottlenose dolphin	0.037	79	0.72
Common dolphin	0.171	363	0.35
Minke whale	0.002	4	0.02
Harbour porpoise	0.213	452	0.13
Harbour seal	0.007	15	0.56
Grey seal	0.002	4	0.01

Magnitude of impact

11.9.37 The magnitude is predicted to be of local spatial extent, short term duration and intermittent. However, as PTS is a permanent change in hearing threshold and not something an individual can recover from, Rampion 2 will need to apply for a subsequent EPS and marine licence conditions including the implementation of a UXO MMMP to reduce the risk to negligible. Exact mitigation measures will need to be agreed with Natural England, once detailed UXO information is available however examples of industry proven mitigation measures in which the project has high confidence in efficacy that may need to consider are detailed in the **Draft UXO Clearance MMMP** (Document Reference: 7.15), such as the use of ADDs and noise abatement. The magnitude of this impact is therefore considered **Low**.

Sensitivity or value of receptor

11.9.38 Most of the acoustic energy produced by a high-order detonation is below a few hundred Hz, decreasing on average by about SEL 10 dB per decade above 100 Hz, and there is a pronounced drop-off in energy levels above ~5-10 kHz (von Benda-Beckmann *et al.,* 2015; Salomons *et al.,* 2021).Therefore, the primary acoustic energy from a high-order UXO detonation is below the region of greatest sensitivity for marine mammals (Southall *et al.,* 2019). If PTS were to occur within this low frequency range, it will be unlikely to result in any significant impact to vital rates. Therefore, marine mammals are expected to have a **Low** sensitivity to PTS from UXO clearance.

11.9.39 As stated in JNCC (2020), “a one-off explosion would probably only elicit a startle response and would not cause widespread and prolonged displacement”. Therefore, the sensitivity of marine mammals to disturbance from UXO clearance is considered to be **Low**.

Significance of residual effect

11.9.40 Overall, the maximum sensitivity of marine mammals to underwater noise from other UXO clearance is **low**, with a maximum magnitude of effect predicted to be **low**. Therefore, the significance of effect of underwater noise from other construction activities is predicted to be of **minor significance** which is **not significant** in EIA terms

Underwater noise from seabed preparation, rock dumping and cable installation

Overview

11.9.41 While impact piling will be the worst-case noise source during the construction phase, there will also be several other construction activities that will produce underwater noise which may occur either alongside piling or separately. These include dredging, drilling, cable laying, rock placement and trenching.

11.9.42 Modelling presented in **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) using the non-impulsive weighted SEL_{cum} PTS and TTS thresholds from Southall *et al.,* (2019), resulted in estimated PTS and TTS impact ranges of <100m (the resolution limit for the model) for all marine mammal species for non-piling construction noise sources such as cable laying, trenching and medium sized vessels. As such, to be at risk of auditory injury, an animal would have to stay within the immediate vicinity of the noise source for 24 hours. This is considered unrealistic and therefore, the risk of auditory injury to marine mammals from these activities is considered to be *de minimis*.

11.9.43 For other non-piling construction noise sources (suction dredging, rock placement, and large vessels) the estimated TTS ranges were <100m for low frequency cetaceans, high frequency cetaceans, and phocine carnivores in water. However, for very high frequency cetaceans the estimated TTS ranges were between 200 and 1000m.

11.9.44 The potential effects of cabling techniques used in the offshore wind farm industry was reviewed in a report by the Department for Business Enterprise and Regulatory Reform (BERR) in association with Defra, (BERR and Defra, 2008). The report reviewed various cable types and installation methods including burial ploughs, machines, ROVs and sleds and the burial methods themselves including jetting, rock ripping, and dredging. The review concluded that it would be “highly unlikely that cable installation would produce noise at a level that would cause a behavioural reaction in marine mammals”.

11.9.45 There is evidence that dolphins, porpoise and minke whales avoid areas when high levels of dredging activity occur, however this effect was only short range (up to 5 km) and temporary (Pirotta *et al.,* 2013; Verboom, 2014 and Culloch *et al.,* 2016). Therefore, any potential displacement from dredging activities will be both temporary and localised. As a result, it is unlikely to significantly affect marine mammal populations. It is also highly likely that the presence of vessels will act as a deterrent and disturb marine mammals out of the area before any non-piling construction activity begins (as has been documented for harbour porpoise, e.g. Brandt *et al.,* 2018; Graham *et al.,* 2019 and Benhemma-Le Gall *et al.,* 2021).

11.9.46 A case study example on suction dredging from McQueen *et al.,* (2019) suggested that whilst a using a hopper dredge, harbour porpoises and harbour seals would exhibit behavioural disturbance up to 400m away. Conservative estimates suggest avoidance ranges of <5 km (Ainslie *et al.,* 2014) however, given the context of dredging areas and likelihood for additional activities in the area, individuals are likely already displaced from the area.

11.9.47 Limited research has gone into the impacts of trenching and rock placement on marine mammals; however, the noise emitted is likely to be broadband and with energy below 1 kHz (Reine *et al.,* 2014). As a result, there is potential for behavioural disturbance and avoidance (Pirotta *et al.*, 2013), but with most effects likely operating on prey species thus impacting marine mammals indirectly (Todd *et al.,* 2015).

Magnitude of impact

11.9.48 Noise impacts from other construction activities will be localised, short-term, intermittent, and reversible and as such the magnitude of the impact is considered to be **very low**. Any potential effects are considered to be very short-term and recoverable, with no potential for survival and reproductive rates to be impacted to the extent that the population trajectory will be altered.

Sensitivity or value of the receptor

11.9.49 With the exception of grey seals, all of the marine mammals assessed to have a **low** sensitivity to disturbance caused from noise. Grey seals have a **very low** sensitivity, due to their capital breeder life history and their tolerance of periods of fasting.

Significance of residual effect

11.9.50 Overall, the maximum sensitivity of marine mammals to underwater noise from other construction activities is **low**, with a maximum magnitude of effect predicted to be **very low**. Therefore, the significance of effect of underwater noise from other construction activities is predicted to be **of negligible significance** which is **not significant** in EIA terms.

Vessel collision risk

Overview

11.9.51 The area surrounding the proposed development (for this assessment considered to be the study area established in **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference: 6.2.13)) experiences an average of 17 unique vessels per day passing through the array area in the summer, and 17 unique vessels per day in the winter (see **Chapter 13: Shipping and navigation**). The Proposed Development is also in relative proximity to the shipping lanes through the English Channel, with the Traffic Separation Scheme being approximately 2.4 nm from the proposed DCO Order Limits at its closest point, and 4.2nm from the outer edge of the westbound lane. Using the study are assessed for **Chapter 13: Shipping and Navigation**, there are approximately 119

vessels travelling through the wider area around the Proposed Development per day, with the majority of vessel traffic following the major shipping lanes through the English Channel to the south of the Proposed Development. Therefore, it can be stated that the introduction of vessels during construction is not a novel impact for marine mammals present in the area.

11.9.52 During construction of the wind farm, a potential source of impact from increased vessel activity is physical trauma from collision with a boat or ship. These injuries include blunt trauma to the body or injuries consistent with propeller strikes. The risk of collision of marine mammals with vessels will be directly influenced by the type of vessel and the speed with which it is travelling (Laist *et al.,* 2001) and indirectly by ambient noise levels underwater and the behaviour the marine mammal is engaged in.

11.9.53 There is currently a lack of information on the frequency of occurrence of vessel collisions as a source of marine mammal mortality. There is little evidence from marine mammals stranded in the UK that injury from vessel collisions is an important source of mortality. The UK Cetacean Strandings Investigation Programme (CSIP) documents the annual number of reported strandings and the cause of death for those individuals examined post-mortem. The CSIP data shows that very few strandings have been attributed to vessel collisions, therefore, while there is evidence that mortality from vessel collisions can and does occur, it is not considered to be a key source of mortality highlighted from post-mortem examinations.

11.9.54 Harbour porpoises, dolphins and seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision. Minke whales have previously shown displacement in areas with high vessel density in response to noise (Anderwald *et al.,* 2013), which can reduce the chance of impact collision. Predictability of vessel movement by marine mammals is known to be a key aspect in minimising the potential risks imposed by vessel traffic (e.g. Nowacek *et al.,* 2001, Lusseau, 2003, 2006). The VMP (C-51,**Table 11-14**) will ensure that vessel traffic moves along predictable routes and will define how vessels should behave in the presence of marine mammals.

11.9.55 It is highly likely that a proportion of vessels will be stationary or slow moving throughout construction activities for significant periods of time, particularly smaller vessels. Therefore, the actual increase in vessel traffic moving around the proposed DCO Order Limits and to/from the port to the site will occur over short periods of the offshore construction activity.

11.9.56 Additionally, the proposed implementation of a VMP (C-51, **Table 11-14**) will minimise the risk of vessel collisions, and the guidance from the MWWC as part of the VMP (C-51, **Table 11-14**) will be followed, which includes additional mitigation measures such as reducing speed to the safest minimum possible when passing close to marine mammals, ensuring that vessel movements are steady and along predictable routes, maintaining recommended minimum distances from marine mammals, being aware not to cut off individuals from groups, keep engine and propellor maintained to minimum possible noise.

Magnitude of impact

11.9.57 Due to the proposed implementation of a VMP (C-51, **Table 11-14**), and adherence of the MWWC as part of that, the magnitude of vessel collisions with marine mammals during construction activities relating to the Proposed Development is considered to be **very low**.

Sensitivity or value of the receptor

11.9.58 All marine mammal receptors are deemed to be of medium vulnerability given that vessel collision is not considered to be a key source of mortality highlighted from post-mortem examinations of stranded animals. However, should a collision event occur, this is likely to injure the animal, from which they may have limited ability to recover from and could potentially be fatal. Therefore, as a result of the low vulnerability to a strike but the serious consequences of a strike, the sensitivity of marine mammal receptors to vessel collisions is considered to be **high**.

Significance of residual effect

11.9.59 Overall, the sensitivity of all marine mammals to vessel collisions has been assessed as **high** and the magnitude is predicted to be **very low** given that a VMP includes adherence to the MWWC (C-51, **Table 11-14**) will be implemented. Therefore with the mitigation in place the effect is concluded to be of **minor adverse significance**, which is **not significant** in EIA terms.

Vessel disturbance

Overview

11.9.60 Increased vessel traffic during construction has the potential to result in disturbance of marine mammals, either from the noise generated by the vessels or from the presence of the vessels. Disturbance from vessels is only likely to occur where vessel movements associated with the construction of the Proposed Development is greater than the background vessel presence. The maximum design scenario (**Table 11-13**) lists the maximum number of vessels that will be involved in construction, with an average of up to four return trips per day. The total duration of the installation campaign for WTGs is expected to be a maximum of 12 months.

11.9.61 During the period of piling operations, it is considered unlikely that vessel noise will impact marine mammal receptors at levels additional to the piling activity itself. It is difficult to separate out the effect of vessel presence and activity from the effect of pile driving in isolation, since the data collected to date on the response of animals to pile driving, will have included a degree of vessel activity in combination with the piling, therefore it could be considered that the typical vessel activity related to pile driving, may be already assessed to some extent under the pile driving assessment. Individuals have more potential to be impacted by increased vessel movements during periods when piling is not taking place. Graham *et al.*, (2019) identified that for harbour porpoise, the presence of vessels alone was sufficient to reduce the presence of harbour porpoise within approximately 1 km of the vessel, which confirms that other, non-piling, vessels are likely to result in a degree of

vessel disturbance separate from that of piling. The detections of marine mammals remained low after piling ceased for a few hours, possibly due to the remaining disturbance from the vessel, however after retuned to baseline levels after this period (Graham *et al.,* 2019).

11.9.62 The magnitude and characteristics of vessel noise varies depending on ship type, ship size, mode of propulsion, operational factors (loading, etc.) and speed. Vessels of varying size produce different frequencies, generally becoming lower frequency with increasing size. The distance at which animals may react is difficult to predict and behavioural responses can vary a great deal depending on context.

Magnitude of impact

11.9.63 Harbour porpoises have a high-frequency hearing range (e.g. Southall *et al.,* 2019), and it has been suggested that porpoises are consequently more likely to be sensitive to vessels that produce medium to high frequency noise components (Hermannsen *et al.,* 2014). Harbour porpoise are known to avoid vessels and behavioural responses have been demonstrated in porpoise exposed to vessel noise that contains limited high-frequency components (Dyndo *et al.,* 2015). Therefore, the sensitivity of porpoise to vessel noise will likely depend on the frequency of the noise components produced by the vessel, however, Thomsen *et al.,* (2006) estimated that porpoise will respond to both small (~2kHz) and large (~0.25kHz) vessels at approximately 400m. Wisniewska *et al.,* (2018) presented data that suggested that whist very close-range vessel passes may result in an interruption in foraging in porpoise, this is short lived with porpoises observed to resume foraging 10 minutes after the vessel encounter. Tagging data, showing porpoises remaining within areas with high shipping levels further showed incidence of responses was low, indicating little fitness cost to exposure to vessel noise.

11.9.64 A study on the impacts from construction related activities at the Beatrice and Moray East offshore windfarms in Scotland has shown that harbour porpoise are displaced by offshore windfarm construction vessels (Benhemma-Le Gall *et al.,* 2021). Construction related vessels assessed in this study included key offshore service vessels used for pile-driving and multileg foundation or turbine installation, as well as other construction-related vessel traffic including fishing vessels working as guard vessels, passenger vessels for crew-transfers and some port service craft or unassigned vessels; and across the Moray Firth during the study period, the median construction-related vessel density was 1.4 vessels/km^2. Passive acoustic monitoring at the site showed that porpoise occurrence (hourly occurrence of porpoise detections) declined within 2 km of construction vessels (from 0.37 when vessel intensity was zero, down to 0.02 for a vessel intensity of 9.8 min/km^2), but that responses declined with increasing distance to vessels, out to 4 km where no response was observed.

11.9.65 Heinänen and Skov (2015) suggested that harbour porpoise density was significantly lower in areas with vessel transit rates of greater than 20,000 ships/year (80 per day within an area of 5 km^2). Vessel traffic in the Proposed Development array area averages 17 vessels per day (see **Chapter 13**). Throughout the construction of the Proposed Development, there will be an average of up to four return trips from construction vessels and the VMP (C-51,

Table 11-14) will ensure that vessel traffic moves along predictable routes and will define how vessels should behave in the presence of marine mammals.

11.9.66 Jones *et al.,* (2017) presents an analysis of the predicted co-occurrence of ships and seals at sea which demonstrates that UK wide there is a large degree of predicted co-occurrence, particularly within 50 km of the coast close to seal haul-outs. There is no evidence relating decreasing seal populations with high levels of co-occurrence between ships and animals. In fact, in areas where seal populations are showing high levels of growth (e.g. southeast England) ship co-occurrences are highest (Jones *et al.,* 2017). Thomsen *et al.,* (2006) estimated that both harbour and grey seals will respond to both small (~2 kHz) and large (~0.25 kHz) vessels at approximately 400 m.

11.9.67 The proposed implementation of a VMP (C-51, **Table 11-14**) will reduce the risk of vessel disturbance by controlling the speed and movement of vessels, resulting in slower moving vessels travelling more predictable routes which are less likely to cause disturbance.

Magnitude of impact

11.9.68 With the proposed implementation of a VMP (C-51, **Table 11-14**), the magnitude of vessel disturbance to marine mammals during construction activities relating to the proposed development is considered to be **Low**, indicating that the potential is for short-term and/or intermittent behavioural effects, with survival and reproductive rates very unlikely to be impacted to the extent that the population trajectory will be altered. It is anticipated that any animals displaced from the area will return when vessel disturbance has ended.

Sensitivity or value of receptor

11.9.69 Harbour porpoises have a high-frequency hearing range (e.g. Southall *et al.,* 2019), and it has been suggested that porpoises are consequently more likely to be sensitive to vessels that produce medium to high frequency noise components (Hermannsen *et al.,* 2014). Harbour porpoise are known to avoid vessels and behavioural responses have been demonstrated in porpoise exposed to vessel noise that contains limited high-frequency components (Dyndo *et al.,* 2015). Therefore, the sensitivity of porpoise to vessel noise will likely depend on the frequency of the noise components produced by the vessel.

11.9.70 Wisniewska *et al.,* (2018) presented data that suggested that whist very close-range vessel passes may result in an interruption in foraging in porpoise, this is short lived with porpoises observed to resume foraging 10 minutes after the vessel encounter. Tagging data, showing porpoises remaining within areas with high shipping levels further showed incidence of responses was low, indicating little fitness cost to exposure to vessel noise (Wisniewska *et al.,* 2018). Therefore, the sensitivity of porpoise to disturbance from vessels has been assessed as **Low**.

11.9.71 Pirotta *et al.,* (2015), noted small scale, short-term reductions in foraging in bottlenose dolphin due to vessels, with the intensity of the reaction highly variable on a spatial and temporal basis. This further supports previous suggestions that the reaction will likely be linked to the favourability of habitat or behaviour of prey in response to the vessel presence (reviewed in Pirotta *et al.,* 2015). There is

limited information available on the responses of other cetacean species to vessels, however based on the evidence available for bottlenose dolphin and harbour porpoise, it is assumed that the other species have a similar sensitivity as harbour porpoises.

11.9.72 All marine mammal receptors are deemed to be of low vulnerability given the existing evidence of behavioural responses to vessels (see above). Therefore, the sensitivity of marine mammal receptors to vessel disturbance is considered to be **Low**.

Significance of residual effect

11.9.73 Overall, the sensitivity of all marine mammals to vessel disturbance has been assessed as **Low** and the magnitude is predicted to be **Low**. Therefore, the effect has been assessed as **Minor Significance**, which is **Not Significant** in EIA terms.

Changes to prey availability

Overview

11.9.74 Given that marine mammals are dependent on fish as prey, there is the potential for indirect effects on marine mammals as a result of impacts upon fish species or the habitats that support them. The key prey species of each marine mammal receptor are listed in **Table 11-32**.

11.9.75 As a result of the development there is likely to be impacts on prey species (fish and shellfish receptors), in particular from seabed preparation and direct disturbance to it. The impact pathways assessed in **Chapter 8 Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) are:

- mortality, injury, behavioural changes and auditory masking arising from noise and vibration;
- mortality and potential mortal injury;
- recoverable injury;
- TTS;
- behavioural impacts;
- UXO clearance and noise vibrations;
- direct disturbance from installation of the export cable;
- direct disturbance resulting from construction within the array;
- temporary localised increase in suspended sediment concentrations (SSC) and smothering; and
- direct and indirect seabed disturbance leading to the release of sediment contaminants.

Table 11-32 Common prey species for each of the marine mammal receptors. Key species are identified with an asterisk

Receptor Species	Prey Species	References
Bottlenose dolphin	Cod*, saith, whiting*, salmon*, haddock, cephalopods*	Santos *et al*., 2001
Common dolphin	Mackerel*, lanternfish, lancet fish, *Gadidae* spp.*, *Gobiidae* spp.*, cephalopod**	Brophy *et al*., 2009
Harbour porpoise	Whiting*, sandeel*, herring*, haddock, saith, pollock, bobtail squid	Pierce *et al*., (2007)
Minke whale	Sandeel*, herring*, sprat*, mackerel*, goby*, Norway pout/poor cod*	Pierce *et al*., (2004)
Harbour seal	Sandeel*, whiting*, dragonet*, cod*, herring*, sprat*, dover sole*, plaice*, lemon sole*, dab*, flounder*, goby*, bullrout, sea scorpion, octopus, squid*	Wilson and Hammond (2016) SCOS (2017)
Grey Seal	Sandeel*, cod*, whiting*, haddock, ling, plaice*, sole*, flounder*, dab*	SCOS (2017)

*Prey species identified that are in the present in the Rampion 2 ES boundary (see further details in Chapter 8: Fish and shellfish ecology

11.9.76 **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) concludes no significant impacts on all of the relevant prey species described in **Table 11-32** during the construction phase. For specifics of the mitigation measures put in place for prey species such as herring please see **Table 8.6** in **Chapter 8: Fish and shellfish ecology** and Rampion 2 Technical note: Underwater noise mitigation for sensitive features (located in Appendix D of the **Evidence Plan** (Document Reference: 7.21)). While there may be certain species that comprise the main part of their diet, all marine mammal species in this assessment are considered to be generalist feeders and are thus not reliant on a single prey species.

Magnitude of impact

11.9.77 Due to the lack of significant effect on prey species and the generalist/opportunist nature of the receptors in question, together with the low numbers of marine

mammals in vicinity of the Proposed Development, the magnitude of changes to prey availability to during construction activities is considered to be **Very Low** very short-term and recoverable, with no potential for survival and reproductive rates to be impacted to the extent that the population trajectory will be altered.

Sensitivity or value of the receptor

11.9.78 Changes to prey availability could increase the energy expenditure required for feeding through increased effort. However, as marine mammals are generalists they can switch prey species removing the requirement for additional energy expenditure. No impact on survival and reproduction is predicted and therefore the sensitivity of the receptor is considered to be **Low**.

Significance of residual effect

11.9.79 Overall, the magnitude of all marine mammal receptors to a change in prey availability has been assessed as **Very Low**, with a sensitivity of **Low**. Due to the very low magnitude of the effect, there will be no indirect effect to the marine mammal receptors, with the significance of effect predicted to be of **Negligible Significance**, which is **Not Significant** in EIA terms.

Disturbance to seal haul out sites and landfall

Overview

11.9.80 Both grey and harbour seals are known to haul out in low numbers at Chichester Harbour and other sites in the local area (Castles *et al.,* 2021). The main potential for disturbance to seals at haul out sites is from the transit of vessels. Previous studies have demonstrated the disturbance effects on harbour seals at haul-out sites. For example, controlled disturbance vessel trials have shown that harbour seals would reduce the amount of time hauled out around the point of disturbance and they would embark on a foraging trip before hauling out again at the next low-tide cycle (Paterson *et al.*, 2015). This was also shown in Andersen *et al.,* (2011) where extended inter-haul-out trips occurred directly after a disturbance event. This is particularly important in terms of energetic consequences if this disturbance occurs at a time that is critical for seals to be hauled-out, such as during the annual moult or the breeding season.

11.9.81 It is possible that vessel traffic could result in hauled out animals flushing into the water (Jansen *et al.,* 2015). Andersen et al., (2011) showed that flushing out at Danish haul out sites occurred at distances of 510-830 m from approaching vessels. However, in the proposed study area, the local haul out sites are already exposed to relatively high levels of vessel activities as are located within active harbours (see **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference: 6.2.13)) and it is therefore considered that there will be a *de minimis* disturbance effect to seals at haul out caused by the additional vessels for the Proposed Development (see the vessel disturbance assessment above, and **Table 11-14**).

11.9.82 The sound levels at the haul out sites are lower than those expected from background noise from vessels transiting through the Solent as such the animals

are likely to habituated to the sound levels received. Therefore, it is not considered that there will be any disturbance from such sites or blocking effects from the noise altering ingress and egress of the seals from the haul out sites.

Magnitude of impact

11.9.83 The magnitude is considered to be **Very Low**, given that the local haul out sites are already exposed to relatively high levels of vessel activities and animals are likely to habituated vessel disturbance.

Sensitivity or value of receptor

11.9.84 The sensitivity of seals to disturbance from haul out sites is likely to vary depending on the time of year and the reason the animals are hauled out. Castles *et al* (2021) recorded harbour seal pups only a few hours old within Chichester harbour, and thus the site was identified as a pupping area. Therefore, it is expected that during the breeding season (May - September), harbour seals sensitivity to disturbance at haul-out sites is **Medium** as disturbance may result in impacts to vital rates – particularly for new-born pups. At other times of the year the sensitivity is likely to be lower. Grey seals are not known to pup at any location in the Solent (Castles *et al*. 2021).

Significance of residual effect

11.9.85 During the harbour seal breeding season, the sensitivity of harbour seals to disturbance has been assessed as **Medium**. At other times of the year the sensitivity is likely to be lower. Given the existing levels of traffic and the likelihood that seals are habituated to vessel presence in the area, the magnitude is predicted to be **Very Low**. Therefore, the resulting impact significance for disturbance to seal haul outs is of **Minor Significance** at most (lower outside of the breeding season), which is **Not Significant** in EIA terms.

11.10 Assessment of effects: Operation and maintenance phase

Operational noise

Overview

11.10.1 Underwater noise from operational WTGs will be a continuous low-level sound which is generated from the vibration of the rotating machinery within the WTG which is transmitted into the marine environment through the WTG structure and foundations. Modelling of the predicted sound levels from the operation of WTGs is presented in the **Appendix 11.2: Marine mammal quantitative underwater noise impact assessment, Volume 4** of the ES (Document Reference: 6.4.11.2) with the highest power WTGs expected to result in the loudest noise (when operating at maximum capacity, with lower sound levels expected the majority of the time).

11.10.2 Using the non-impulsive weighted SEL_{cum} PTS thresholds from Southall *et al.,* (2019) resulted in estimated PTS impact ranges of <100m for all marine mammal species, see **Appendix 11.3: Underwater noise assessment technical report, Volume 4** of the ES (Document Reference: 6.4.11.3) for more details.

11.10.3 Numerous reviews (e.g. MMO, 2014) and studies (e.g. Madsen *et al.,* 2006, Teilmann *et al.,* 2006, CEFAS, 2010, Brasseur *et al.,* 2012, Diederichs *et al.,* 2008) of the effects of operational WTGs on marine mammals have demonstrated that the likelihood of any behavioural impacts is low and will be extremely localised if any such were to arise. Notably, a number of studies have suggested that operational wind farms may provide beneficial foraging areas for marine mammals (e.g. Lindeboom *et al.,* 2011), with a monitoring programme at the Egmond aan Zee Offshore Wind Farm in the Netherlands reported that significantly more porpoise activity was recorded within the wind farm compared to the reference area during the operational phase (Scheidat *et al.,* 2011). Russell *et al.,* (2014) also observed tagged harbour and grey seals swimming in a grid-like pattern between WTGs within a wind farm, strongly suggesting that the structures provide favourable foraging habitats, with the individuals evidently not displaced by operational noise.

11.10.4 These studies were all conducted at wind farms with relatively small sized turbines, and thus there is uncertainty as to how applicable the results are to future larger turbine sizes. Tougaard *et al* 2020 and Stöberand Thomsen (2021) showed that as WTG size increases, the underwater sound pressure level also increases. Both studies highlighted that as the size of turbines continues to increase it is expected that the operational noise they produce will also increase. One important factor to consider is that all data used in the studies to date have been measured at geared turbines, and it is the gearbox that is one of the main contributing factors to the generated underwater noise levels. However, recent advances in technology mean that newer WTGs use direct drive technology rather than gears, which are expected to generate lower operational underwater noise levels (sound reduction of around 10 dB compared to the same size geared turbine) (Stöber and Thomsen, 2021).

11.10.5 Therefore, while underwater sound is expected to increase with increasing turbine size, new direct drive technology means that new turbines will produce considerably less underwater noise compared to the older geared turbines. The Applicant acknowledges that there is still a lack of data on operational noise generated by larger size turbines. However, given the presence of marine mammals (both porpoise and seals) within operational wind farms, it is unlikely that operational noise is expected to be of a level that would result in any disturbance effect.

Magnitude of impact

11.10.6 The impact is predicted to be of limited local extent, long term duration and continuous. The magnitude of both PTS and disturbance from operational noise is therefore considered to be **Very Low**.

Sensitivity or value of receptor

11.10.7 Given the evidence of the presence of marine mammals within and around existing operation wind farms, marine mammals are deemed to be of low vulnerability and have high recoverability to the impact of operational noise. The sensitivity of all marine mammal receptors is therefore considered to be **Very Low**.

Significance of residual effect

11.10.8 Overall, the sensitivity of all marine mammal receptors has been assessed as **Very Low** and the magnitude is predicted to be **Very Low**. Therefore, the significance of the effect has been predicted to be of **Negligible Significance** which is **Not Significant** in EIA terms.

Vessel collision risk

Overview

11.10.9 The worst case scenario identifies that there will be up to 1,126 return visits to the Proposed Development per year during the operation phase. This equates to an average of approximately three return trips per day. Vessel types will include crew transport vessels (CTVs), service operation vessels (SOVs), supply vessels, cable and remedial protection vessels and jack-up vessels (JUVs).

11.10.10 Harbour porpoises, dolphins and seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision. Predictability of vessel movement by marine mammals is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek *et al.,* 2001, Lusseau 2003, 2006). The embedded mitigation provided by the proposed VMP including the adherence to the MWWC (C-51, **Table 11-14**) (see details in section 11.9.59) will ensure that vessel traffic moves along predictable routes and will define how vessels should behave in the presence of marine mammals.

Magnitude of impact

11.10.11 With the proposed implementation of a VMP (C-51,**Table 11-14**) and adherence to the MWWC as part of the VMP (C-51, **Table 11-14**), the magnitude of vessel collisions with marine mammals during operation and maintenance activities relating to the proposed development is considered to be **Very Low**.

Sensitivity or value of receptor

11.10.12 All marine mammal receptors are deemed to be of medium vulnerability given that vessel collision is not considered to be a key source of mortality highlighted from post-mortem examinations of stranded animals. However, should a collision event occur, this is likely to injure the animal, from which they may have limited ability to recover from and could potentially be fatal. Therefore, as a result of the low vulnerability to a strike but the serious consequences of a strike, the sensitivity of marine mammal receptors to vessel collisions is considered to be **High**.

Significance of residual effect

11.10.13 Overall, the sensitivity of all marine mammals to vessel collisions has been assessed as **high** and the magnitude is predicted to be **Very Low** given that a VMP (C-51, **Table 11-14**) will be implemented. Therefore, the application of the mitigation enables a conclusion for the effect to be of **Minor Adverse Significance**, which is **Not Significant** in EIA terms.

Vessel disturbance

Overview

11.10.14 The worst-case scenario identifies that there will be 21 vessels at any one time. Vessel types will include crew transport vessels (CTVs), service operation vessels (SOVs), supply vessels, cable and remedial protection vessels and jack-up vessels (JUVs).

11.10.15 Whilst very few studies have considered potential thresholds of vessel traffic which may increase the risk of disturbance, Heinänen and Skov (2015) identified a significant reduction in harbour porpoise density where vessels movements exceeded 80 per day within an area of 5 km^2. Vessel traffic in the area around the proposed development will not exceed this value even with the addition of the operational phase vessel traffic.

Magnitude of impact

11.10.16 The magnitude of vessel disturbance to marine mammals during operation and maintenance activities relating to the Proposed Development is considered to be **Low.** There is the potential for short-term and/or intermittent behavioural effects, with survival and reproductive rates very unlikely to be impacted to the extent that the population trajectory will be altered.

Sensitivity or value of receptor

11.10.17 All marine mammal receptors are deemed to be of low vulnerability given the existing evidence of behavioural responses to vessels (see **Section 11.9**). Therefore, the sensitivity of marine mammal receptors to vessel disturbance is considered to be **Low**.

Significance of residual effect

11.10.18 Overall, the sensitivity of all marine mammals to vessel disturbance has been assessed as **Low** and the magnitude is predicted to be **Low**. The risk of vessel disturbance is reduced given that a VMP (C-51, **Table 11-14**) will be implemented, therefore the effect is of **Minor Significance**, which is **Not Significant** in EIA terms.

Changes to prey availability

Overview

11.10.19 There is the potential for indirect effects on marine mammals as a result of impacts upon prey species or the habitats that support them (e.g. from EMF). The key prey species of each marine mammal receptor are listed in **Table 11-32**.

11.10.20 As per the construction phase (see **Section 11.9**), **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) concludes no significant impacts on all of the relevant prey species described in **Table 11-32** during the operation and maintenance phase.

11.10.21 As noted previously it is even possible that offshore wind farms can increase prey availability or provide more favourable foraging grounds for marine mammals.

Magnitude of impact

11.10.22 Due to the lack of significant effect on prey species and the generalist / opportunist nature of the receptors in question, the magnitude of changes to prey availability to marine mammals during operation and maintenance activities is considered to be **Very Low**. Any potential effect are very short-term and recoverable, with no potential for survival and reproductive rates to be impacted to the extent that the population trajectory will be altered.

Sensitivity or value of receptor

11.10.23 Changes to prey availability could increase the energy expenditure required for feeding through increased effort. However, as marine mammals are generalists they can switch prey species removing the requirement for additional energy expenditure. No impact on survival and reproduction is predicted and therefore the sensitivity of the receptor is considered to be **Low**.

Significance of residual effect

11.10.24 Overall, the magnitude of all marine mammal receptors to a change to prey availability has been assessed as **Very Low** and therefore will not lead to any change in the prey populations. The sensitivity of marine mammal receptors is considered to be **Low**. Consequently, there will be no indirect effects on the marine mammal receptors considered, resulting in an impact of **Negligible Significance**, which is **Not Significant** in EIA terms.

11.11 Assessment of effects: Decommissioning phase

Overview

11.11.1 Impacts from decommissioning are expected to be similar to those listed for construction, if Proposed Development infrastructure is removed from the seabed at the end of the development's operational life phase. The nature and scale of impacts arising from decommissioning are expected to be of similar, or reduced magnitude to those generated during the construction; certain activities such as

piling will not be required. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.

11.11.2 The sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase (see **Section 11.9**). The magnitude of effect is considered to be no greater or potentially less than those considered for the receptors within the construction phase. Therefore, it is anticipated that any decommissioning impacts will be no greater, and probably less than those assessed for the construction phase.

11.11.3 If it is deemed closer to the time of decommissioning that removal of certain parts of the development (for example export and inter-array cables) will have a greater environmental impact than leaving in situ, it may be preferable to leave those parts in situ. In this case, the impacts will be similar to those described for the operation and maintenance phase. If certain parts of the development are left in situ, effects dependent on the operation of the wind farm will not occur.

11.11.4 To date, no large offshore wind farm has been decommissioned in UK waters. It is anticipated that any future programme of decommissioning will be developed in close consultation with the relevant statutory marine and nature conservation bodies. This will enable the guidance and best practice at the time to be applied to minimise any potential impacts.

Decommissioning noise impacts (including PTS, TTS and disturbance)

11.11.5 Piling foundations will likely be cut approximately 1m below the seabed, however, given the operational lifetime of the Proposed Development is assumed to be approximately 30 years, the specific decommissioning plan and programme will not be determined until closer to the time. The Energy Act (2004) requires that a decommissioning plan must be submitted to and approved by the Secretary of State for Business, Energy and Industrial Strategy, a draft of which will be submitted prior to the construction of the Proposed Development. The decommissioning plan and programme will be updated during the Proposed Development's lifespan to take account of changing best practice and new technologies. The approach and methodologies employed at decommissioning will be compliant with the legislation and policy requirements at the time of decommissioning. The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction (with no piling). If noise generating methods are used for decommissioning, best-practice environmental measures as understood at the time will be used to mitigate the potential for PTS, including a decommissioning MMMP (C-54, **Table 11-14**). Accordingly, the impact from PTS, TTS and disturbance to marine mammals from decommissioning has been assessed as of a maximum of **minor adverse significance**, which is **Not Significant** in EIA terms.

Vessel collision risk

11.11.6 The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from

vessel collisions on marine mammals has been assessed as being of **Minor Adverse Significance**, which is **Not Significant** in EIA terms.

Vessel disturbance

11.11.7 The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from vessel disturbance on marine mammals has been assessed as being of **Minor Adverse Significance**, which is **Not Significant** in EIA terms.

Changes to prey availability

11.11.8 The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from changes to prey availability on marine mammals has been assessed as being of **Minor Adverse Significance**, which is **Not Significant** in EIA terms.

Disturbance to seal haul out site at landfall

11.11.9 The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from disturbance to seal haul out sites has been assessed as being of **Minor Adverse Significance**, which is **Not Significant** in EIA terms.

11.12 Assessment of cumulative effects

Approach

11.12.1 A cumulative effects assessment (CEA) examines the combined impacts of Rampion 2 in combination with other developments on the same single receptor or resource and the contribution of Rampion 2 to those impacts. The overall method followed in identifying and assessing potential cumulative effects in relation to the offshore environment is set out in **Section 5.10** of **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5)**.**

11.12.2 The offshore screening approach is based on the Planning Inspectorate's Advice Note Nine (Planning Inspectorate, 2018) and Advice Note Seventeen (Planning Inspectorate, 2019), 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).

Cumulative effects assessment

11.12.3 For marine mammals, a Zone of Influence (ZOI) has been applied for the CEA to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The ZOI for marine mammals is the species specific MU (North Sea MU for porpoise, South and Southeast MUs for seals, Celtic and Greater North Sea MU for minke whales and common dolphins and Offshore Channel and SW England MU for bottlenose dolphins). The marine mammals ZOIs are shown in

Figure 11-4, Volume 3.of the ES (Document Reference 6.3.11). Identification of all offshore projects within each marine mammal MU resulted in the CEA long-list.

11.12.4 A short list of 'other developments' that may interact with the ZOIs during their construction, operation or decommissioning is presented in **Appendix 5.4: Cumulative effects assessment shortlisted developments, Volume 4** of the ES (Document Reference: 6.4.5.4) and on **Figure 5.4.1, Volume 3** of the ES (Document Reference: 6.3.5). This list has been generated applying criteria set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) and has been collated up to the finalisation of the ES through desk study, consultation and engagement. For marine mammals this was accomplished by screening out already operational projects that had been identified in the long list, and thus the short-list consists of all offshore projects within the marine mammal MUs that are expected to be constructing during the time period considered in the CEA.

11.12.5 A tiering structure has been used for screening and assessment of other developments as in accordance with PINS Advice Note Seventeen (**Chapter 5**). Definitions of Tiers are set out in **Table 5-3** of **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5). Where other projects are expected to be completed before construction of the Proposed Development and the effects of those projects are fully determined, effects arising from them are considered as part of the baseline and may be considered as part of both the construction and operational assessment. For this chapter, two additional tiers have also been applied as set out in **Table 11-33**, that align with the tier system proposed in Natural England (2021b). This tiering system has been used for the marine mammal CEA as it is a more structured approach that allows the level of uncertainty associated with the assessment tiers based on the consenting stage of the project.

Table 11-33 Description of tiers of other developments considered for CEA (from Natural England, 2021)

Tier	Stage	Data availability
Tier 1	Built and operational projects should be included within the cumulative assessment where they have not been included within the environmental characterisation survey, i.e. they were not operational when baseline surveys were undertaken, and/or any residual impact may not have yet fed through to and been captured in estimates of "baseline" conditions e.g. "background" distribution or mortality rate for birds.	Pre-construction (and possibly post-construction) survey data from the built project(s) and environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project).

Tier	Stage	Data availability
Tier 2	Tier 1 + projects under construction.	As Tier 1 but not including post-construction survey data.
Tier 3	Tier 2 + projects that have been consented (but construction has not yet commenced).	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project) and possibly pre-construction survey data from built project.
Tier 4	Tier 3 + projects that have an application submitted to the appropriate regulatory body that have not yet been determined.	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project).
Tier 5	Tier 4 + projects that the regulatory body are expecting an application to be submitted for determination (e.g. projects listed under the Planning Inspectorate programme of projects).	Possibly environmental characterisation survey data (but strong likelihood that this data will not be publicly available at this stage).
Tier 6	Tier 5 + projects that have been identified in relevant strategic plans or programmes.	Historic survey data collected for other purposes/by other projects or industries or at a strategic level. See Natural England (2021a) for guidance on using existing datasets.

11.12.6 Screening Projects: Only those 'other developments' in the short list that fall within the marine mammal ZOIs (species specific MU) and are constructing between 2021 and 2030 have the potential to result in cumulative effects with the Proposed Development. All 'other developments' falling outside the marine mammal ZOIs (species specific MU) are excluded from this assessment. The following types of 'other development' have the potential to result in cumulative effects on marine mammals.

- Sub-sea cables and pipelines (telecom and power cables);
- Offshore wind farms;
- Oil and Gas projects;
- Tidal energy;
- Wave energy; and
- Seismic surveys.

11.12.7 Screening Impacts: Certain impacts assessed for Rampion 2 alone are not considered in the marine mammal CEA due to a) the highly localised nature of the impacts b) management and mitigation measures in place at Rampion 2 and on other projects will reduce the risk occurring (e.g. MMMPs) and c) where the potential significance of the impact from Rampion 2 alone has been assessed very low magnitude and therefore not significant. The impacts excluded from the marine mammal CEA for these reasons are:

- auditory injury (PTS): where PTS may result from activities such as pile driving and UXO clearance, suitable mitigation will be put in place to minimise injury risk to marine mammals (as a requirement of European Protected Species legislation);
- collision with vessels: it is expected that all offshore energy projects will employ a VMP to reduce the already low risk of collisions with marine mammals;
- changes in water quality: highly localised and negligible significance;
- changes in prey availability: highly localised and negligible significance; and
- barrier effects / operational noise: highly localised and negligible significance.

11.12.8 Therefore, the impacts that are considered in the marine mammal CEA are as follows:

- the potential for disturbance from underwater noise during construction of developments; and
- the potential for disturbance from vessel activity associated with each development.

11.12.9 Screening species: Due to the fact that underwater noise from the construction of Rampion 2 is anticipated to have negligible effects on seals (<1 animal disturbed per piling day), both harbour and grey seals have been scoped out of the CEA for piling disturbance. All developments listed in **Table 11-34** are screened in for the cumulative assessment for harbour porpoise, minke whales and common dolphins as they are all present within the respective species MUs. All offshore wind farm projects have been screened out for bottlenose dolphins as they are not located within the relevant MU.

11.12.10 Currently the number of seismic surveys that will take place are unknown, but those that do occur in the North Sea, Celtic Sea or Irish Sea could occur within the respective MUs for all species.

11.12.11 On the basis of the above, the following specific developments contained with the short list in **Appendix 5.5: Cumulative effects assessment shortlisted developments, Volume 4** of the ES (Document Reference: 6.4.5.5) are scoped into the CEA. The developments' that are scoped into the marine mammals CEA are outlined in **Table 11-34**.

11.12.12 In order to assess the temporal overlap of the potential impacts from the different developments, it has been assumed that the earliest start of construction for Rampion 2 would commence at the start for 2025 and could continue for 4 years (**Chapter 4: The Proposed Development, Volume 2**). However, given the timeline relies on consent award, the CEA has conservatively assessed until 2029.

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Table 11-34 Developments considered as part of the marine mammals CEA

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
1	Offshore wind farm	Hornsea Project Two	Hornsea Project Two	Operational as of August 2022	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	1	364.3
W40	Offshore wind farm	Neart na Gaoithe	Neart na Gaoithe	Under Construction (Commissioning expected 2023)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	611.5
W38	Offshore wind farm	Moray East	Moray East	Under Construction (Fully commissioned 2022)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	822.8

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W6	Offshore wind farm	Borssele I	Borssele I	Operational 2022	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	1	263.1
W7	Offshore wind farm	Borssele II	Borssele II	Operational 2022	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	1	259.4
W59	Offshore wind farm	Triton Knoll	Triton Knoll	Operational 2021	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	1	307.6
W11	Offshore wind farm	Dogger Bank A	Dogger Bank A	Under construction (Commissioni	High – Third party project details published in the public domain and	2	462.3

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
				ng expected 2024)	confirmed as being 'accurate' by the developer		
W12	Offshore wind farm	Dogger Bank B	Dogger Bank B	Under construction (Commissioning expected 2024)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	473.2
W13	Offshore wind farm	Dogger Bank C	Dogger Bank C	Consented (Construction expected 2023 – 2026)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	508.7
W56	Offshore wind farm	Sofia	Sofia	Consented (Construction expected 2023 – 2026)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	487.9

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W17	Offshore wind farm	East Anglia Three	East Anglia Three	Consented (Construction expected 2023 – 2026)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	298.8
W33	Offshore wind farm	Inch Cape	Inch Cape	Consented (Construction expected from 2021)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	634.2
W52	Offshore wind farm	Seagreen Alpha	Seagreen Alpha	Under construction (Commissioning expected 2023)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	642.1
W53	Offshore wind farm	Seagreen Bravo	Seagreen Bravo	Under construction (Commissioni	High – Third party project details published in the public domain and	2	640.9

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
				ng expected 2023)	confirmed as being ‘accurate’ by the developer		
W30	Offshore wind farm	Hornsea Three	Hornsea Three	Consented (Construction expected 2024 – 2028)	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	390.4
W27	Offshore wind farm	Hornsea Four	Hornsea Four	Consented (Construction expected 2025 – 2030)	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	358.3
W42	Offshore wind farm	Norfolk Vanguard	Norfolk Vanguard	Consented (Construction expected 2024 – 2028)	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	303.6

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W39	Offshore wind farm	Moray West	Moray West	Consented (Construction expected 2022 – 2024)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	819.9
W41	Offshore wind farm	Norfolk Boreas	Norfolk Boreas	Consented (Construction expected 2022 – 2025)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	324.2
W16	Offshore wind farm	East Anglia One North	East Anglia One North	Consented (Construction expected 2023 – 2026)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	261.4
W18	Offshore wind farm	East Anglia Two	East Anglia Two	Consented (Construction expected 2023 – 2026)	High – Third party project details published in the public domain and	3	232.9

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					confirmed as being 'accurate' by the developer		
W1	Offshore wind farm	Awel y Mor	Awel y Mor	Application Submitted	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	4	376
W21	Offshore wind farm	Five Estuaries (Galloper extension)	Five Estuaries (Galloper extension)	Proposed	Low – Environmental statement not available	5	191.1
W43	Offshore wind farm	North Falls (Greater Gabbard extension)	North Falls (Greater Gabbard extension)	Proposed	Low – Environmental Statement not available	5	172.8
W48	Offshore wind farm	Rampion 1	Rampion 1	Operational	High – Third party project details published in the public domain and confirmed as being	1	0

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					'accurate' by the developer		
W10	Offshore wind farm	Dieppe Le Treport (France)	Dieppe Le Treport (France)	Under construction (2019-2023)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	<50
W20	Offshore wind farm	Fécamp (France)	Fécamp (France)	Under construction (2020-2023)	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	<50
W55	Offshore wind farm	Sheringham Shoal and Dudgeon extensions	Sheringham Shoal and Dudgeon extensions	Application submitted	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	4	283.6

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W65	Offshore wind farm	Erebus	Erebus	Consented	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	362
W66	Offshore wind farm	Berwick Bank	Berwick Bank	Application submitted	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	4	614.6
W67	Offshore wind farm	Morgan	Morgan	Proposed	Low – Environmental Statement not available	5	428
W68	Offshore wind farm	Mona	Mona	Proposed	Low – Environmental Statement not available	5	390.1
W69	Offshore wind farm	Morecambe	Morecambe	Proposed	Low – Environmental	5	400.3

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					Statement not available		
W70	Offshore wind farm	Isle of Man	Isle of Man	Proposed	Low – Environmental Statement not available	5	455.5
W71	Offshore wind farm	Dublin	Dublin	Proposed	Low – Environmental Statement not available	5	455.7
W72	Offshore wind farm	Codling	Codling	Proposed	Low – Environmental Statement not available	5	439.7
W73	Offshore wind farm	NISA	NISA	Proposed	Low – Environmental Statement not available	5	477.3
W74	Offshore wind farm	Arklow Bank 2	Arklow Bank 2	Proposed	Low – Environmental Statement not available	5	435

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W78	Offshore Wind Farm	Kinsale	Kinsale	Proposed	Low – Environmental Statement not available	5	550
W80	Offshore Wind Farm	Inis Ealga	Inis Ealga	Proposed	Low – Environmental Statement not available	5	485
W81	Offshore Wind Farm	Celtic Sea Array	Celtic Sea Array	Proposed	Low – Environmental Statement not available	5	450
W82	Offshore Wind Farm	North Celtic Sea	North Celtic Sea	Proposed	Low – Environmental Statement not available	5	460
W83	Offshore Wind Farm	Blackwater	Blackwater	Proposed	Low – Environmental Statement not available	5	410
W86	Offshore Wind Farm	Llyr 1	Llyr 1	Proposed	Low – Environmental Statement not available	5	340

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W87	Offshore Wind Farm	Llyr 2	Llyr 2	Proposed	Low – Environmental Statement not available	5	330
W88	Offshore Wind Farm	Llywelyn	Llywelyn	Proposed	Low – Environmental Statement not available	5	370
W89	Offshore Wind Farm	Gwynt Glas	Gwynt Glas	Proposed	Low – Environmental Statement not available	5	360
W90	Offshore Wind Farm	Petroc	Petroc	Proposed	Low – Environmental Statement not available	5	350
W91	Offshore Wind Farm	Shelmalere	Shelmalere	Proposed	Low – Environmental Statement not available	5	420
W93	Offshore Wind Farm	South Irish Sea	South Irish Sea	Proposed	Low – Environmental Statement not available	5	420

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W96	Offshore Wind Farm	Wicklow	Wicklow	Proposed	Low – Environmental Statement not available	5	440
W98	Offshore Wind Farm	Greystones	Greystones	Proposed	Low – Environmental Statement not available	5	446
W101	Offshore Wind Farm	Braymore Wind Park	Braymore Wind Park	Proposed	Low – Environmental Statement not available	5	496
W103	Offshore Wind Farm	North Channel Wind 1	North Channel Wind 1	Proposed	Low – Environmental Statement not available	5	585
W104	Offshore Wind Farm	North Channel Wind 2	North Channel Wind 2	Proposed	Low – Environmental Statement not available	5	553
W106	Offshore Wind Farm	Shearwater One	Shearwater One	Proposed	Low – Environmental Statement not available	5	693

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W107	Offshore Wind Farm	Machair Wind	Machair Wind	Proposed	Low – Environmental Statement not available	5	702
Wa1	Wave	Bombora	Bombora	Consented	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	330
W112	Offshore wind farm	Twinhub	Twinhub	Consented	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	2	352
W113	Offshore Wind Farm	Princess Elizbeth Noordhinder Noord tender	Princess Elizbeth Noordhinder Noord tender	Development Zone	Low – Environmental Statement not available	6	200
W114	Offshore Wind Farm	Borkum Rifgrund 3	Borkum Rifgrund 3	Consented	High – Third party project details	3	430

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					published in the public domain and confirmed as being 'accurate' by the developer		
W115	Offshore Wind Farm	GoDe wind 3	GoDe wind 3	Consented	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	555
W116	Offshore Wind Farm	EnBw He Dreiht	EnBw He Dreiht	Consented	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	3	545
W117	Offshore Wind Farm	N-3.7 (North sea cluster - gode wind)	N-3.7 (North sea cluster - gode wind)	Proposed	Low – Environmental Statement not available	6	560

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W118	Offshore Wind Farm	N-3.8 (North sea cluster - Nordsee Two)	N-3.8 (North sea cluster - Nordsee Two)	Proposed	Low – Environmental Statement not available	6	560
W119	Offshore Wind Farm	N-7.2	N-7.2	Proposed	Low – Environmental Statement not available	6	560
W120	Offshore Wind Farm	Kaskasi	Kaskasi	Operational since 2022	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	1	665
W121	Offshore Wind Farm	Hesselo	Hesselo	Proposed	Low – Environmental Statement not available	5	1010
W122	Offshore Wind Farm	Thor	Thor	Proposed	Low – Environmental Statement not available	5	835

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W123	Offshore Wind Farm	Frederikshavn offshore demo	Frederikshavn offshore demo	Proposed	Low – Environmental Statement not available	5	1040
W124	Offshore Wind Farm	Outer Dowsing	Outer Dowsing	Proposed	Low – Environmental Statement not available	5	325
W125	Offshore Wind Farm	Vesterhav Nord/Sud	Vesterhav Nord/Sud	Under Construction	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	2	810
W126	Offshore Wind Farm	Calvados	Calvados	Under construction	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	2	130
W127	Offshore Wind Farm	Saint-Brieuc	Saint-Brieuc	Under construction	High – Third party project details	2	263

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					published in the public domain and confirmed as being 'accurate' by the developer		
W128	Offshore Wind Farm	Dunkerque	Dunkerque	Proposed	Low – Environmental Statement not available	5	165
W129	Offshore Wind Farm	Oriel	Oriel	Proposed	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	5	517
W130	Offshore Wind Farm	Hollandse Kust Zuid Holland I and II	Hollandse Kust Zuid Holland I and II	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	320

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W131	Offshore Wind Farm	Hollandse Kust Zuid Holland III and IV	Hollandse Kust Zuid Holland III and IV	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	320
W132	Offshore Wind Farm	Hollandse Kust Noord	Hollandse Kust Noord	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	320
W134	Offshore Wind Farm	Hollandse Kust West Site VI	Hollandse Kust West Site VI	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	330
W135	Offshore Wind Farm	Ten noorden van de Waddeneiland en	Ten noorden van de Waddeneiland en	Proposed	Low – Environmental Statement not available	5	555

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W136	Offshore Wind Farm	Hollandse Kust West Site VII	Hollandse Kust West Site VII	Proposed	Low – Environmental Statement not available	5	310
W137	Offshore Wind Farm	Hywind Tampen	Hywind Tampen	Under construction	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	2	1000
W139	Offshore Wind Farm	Seatwirl S2	Seatwirl S2	Consented	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	1020
W140	Offshore Wind Farm	Seagreen	Seagreen	Under construction	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	2	665

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
W141	Offshore Wind Farm	Dolphyn project	Dolphyn project	Proposed	Low – Environmental Statement not available	5	715
W142	Offshore Wind Farm	Beech	Beech	Proposed	Low – Environmental Statement not available	5	780
W143	Offshore Wind Farm	Aspen	Aspen	Proposed	Low – Environmental Statement not available	5	1100
W144	Offshore Wind Farm	ForthWind demo project phase 1	ForthWind demo project phase 1	Consented	High – Third party project details published in the public domain and confirmed as being ‘accurate’ by the developer	3	635
T1	Tidal	Fair head	Fair head	Under construction	High – Third party project details published in the public domain and confirmed as being	2	630

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					'accurate' by the developer		
T2	Tidal	Holyhead deep	Holyhead deep	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	400
W154	Offshore Wind Farm	Clarus	Clarus	Proposed	Low – Environmental Statement not available	5	700
W159	Offshore Wind Farm	West of Orkney	West of Orkney	Proposed	Low – Environmental Statement not available	5	935
W161	Offshore Wind Farm	Caledonia	Caledonia	Proposed	Low – Environmental Statement not available	5	825
	Offshore Wind Farm	Talisk*	Talisk	Proposed	Low – Environmental	5	973.19

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
					Statement not available		
	Offshore Wind Farm	Stromar*	Stromar	Proposed	Low – Environmental Statement not available	5	864.74
	Offshore Wind Farm	Broadshore*	Broadshore	Proposed	Low – Environmental Statement not available	5	832.04
	Offshore Wind Farm	MarramWind*	MarramWind	Proposed	Low – Environmental Statement not available	5	815.09
	Offshore Wind Farm	Muir Mhòr*	Muir Mhòr	Proposed	Low – Environmental Statement not available	5	714.7
	Offshore Wind Farm	CampionWind*	CampionWind	Proposed	Low – Environmental Statement not available	5	714.59

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
	Offshore Wind Farm	Bellrock*	Bellrock	Proposed	Low – Environmental Statement not available	5	677.86
	Offshore Wind Farm	Ossian*	Ossian	Proposed	Low – Environmental Statement not available	5	646.42
	Offshore Wind Farm	Morven*	Morven	Proposed	Low – Environmental Statement not available	5	640.43
	Offshore Wind Farm	Ayre*	Ayre	Proposed	Low – Environmental Statement not available	5	904.81
	Offshore Wind Farm	Bowdun*	Bowdun	Proposed	Low – Environmental Statement not available	5	694.43
	Offshore Wind Farm	Cedar*	Cedar	Proposed	Low – Environmental Statement not available	5	683.37

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
	Offshore Wind Farm	Cenos*	Cenos	Proposed	Low – Environmental Statement not available	5	674.70
	Offshore Wind Farm	Greenvolt*	Greenvolt	Proposed	Low – Environmental Statement not available	5	793.22
	Offshore Wind Farm	Havbredey*	Havbredey	Proposed	Low – Environmental Statement not available	5	955.75
	Offshore Wind Farm	Spiorad na Mara*	Spiorad na Mara	Proposed	Low – Environmental Statement not available	5	945.11
C1	Cable	AQUIND	AQUIND (UK to France)	Application submitted, consent refused January 2022, applied for judicial review, decision	High	4	0

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
				overturned 2023 and application to be redetermined			
C5	Cable	Viking Link IC	Viking Link IC	Under construction	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	Unknown
C4	Cable	Greenlink interconnector	Greenlink interconnector	Consented (Construction 2024)	High	3	330
CC1	Carbon capture	Endurance Carbon capture	Endurance Carbon capture and storage area	Proposed	Low	5	Unknown
O1	Oil and Gas	Johnston WHPS	Johnston WHPS	Proposed	Low	5	390
O2	Oil and Gas	Johnston template/manifold	Johnston template/ manifold	Proposed	Low	5	390

ID	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[1]	Distance to Rampion 2 array (km)
T1	Tidal energy	Perpetuus Tidal Energy Centre (PTEC)	Perpetuus Tidal Energy Centre (PTEC)	Application Submitted	High – Third party project details published in the public domain and confirmed as being 'accurate' by the developer	2	47.7
Seismic surveys				Assumption: one in Irish Sea at any one time and four in North Sea at any one time			
***ScotWind leasing round projects have no confirmed construction dates and therefore not considered further in the CEA							

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11.12.13 The cumulative Project Design Envelope is described in **Table 11-35**. The impacts included address those scoped in for the cumulative assessment within the Scoping Report (RED, 2020). Other developments included are drawn from **Table 11-34** in the context of the potential for temporal overlap of relevant works.

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Table 11-35 Cumulative Project Design Envelope for marine mammals

Project phase and activity/impact	Scenario	Justification
Cumulative increase in underwater noise	MDS as described for the construction of the proposed development assessed cumulatively with the following projects within the marine mammal study area: Tier 1: Moray East, Triton Knoll Tier 2: Construction phase of Neart Na Gaoithe, Borselle 1, Borselle 2, Dieppe le Treport, Dogger Bank A, Dogger Bank B, Hornsea Project Two, Seagreen Alpha, Seagreen Bravo, Twinhub, Kaskasi, Vesterhav Nord/Sud, Calvados, Hollandse Kust Zuid Holland IV and III, Hollands Kust Nord, Hollandse Kust West Site VI, Hywind Tampen, Seagreen, Fair Head, Hollyhead Deep, Viking IC. Tier 3: Construction of Dogger Bank C, East Anglia One North, East Anglia Two, Bombora, Borkum Rifgrund 3, GoDe Wind 3, EnBw He Dreidt, Seatwirl S2, Forthwind Demo phase 1, Sofia, Inch Cape, East Anglia Three, Hornsea Three, Hornsea Four, Greenlink IC. Tier 4: Construction of Awel y Mor, Erebus, Norfolk Boreas, Norfolk Vanguard, Perpetuus, AQUIND IC. Tier 5: Five Estuaries, North Falls, Sheringham and Dudgeon Extensions, Berwick Bank, Morgan, Mona, Morecambe, Isle of Man, Dublin, Codling, NISA, Arklow Bank, Kinsale, Inis Ealga, Celtic Sea array, North celtic sea, Blackwater, Llyr 1, Lyr 2, Llywelyn, Gwynt Glas, Petroc, Shelmalere. South Irish Sea, Greystones, Braymore wind park, North Channel 1, North Channel 2, Shearwater 1, Machair wind, Hesselo, Thor, Frederikshavn Demo, Outer Dowsing, Dunkerque, Ten Noorden van de Waddeneilanden, Hollandse Kust West Site VII, Dolphyn Project, Beech, Aspen, Clarus, West of Orkney, Caledonia Tier 6: Princess Elizabeth Noorhinder Noord tender, N-3., N-3.8, N-7.2, Seismic surveys in the North Sea (x4 at any one time)	Maximum potential for the identified projects may introduce underwater noise into the marine environment. As noted in **Table 11-34**, those projects which are due to be constructed prior to the construction of the proposed development have been excluded from the CEA as there will be no overlap between piling events. Cumulative operational phase impacts will be reduced and are not considered separately.

Project phase and activity/impact	Scenario	Justification
Cumulative increase in vessel disturbance	Tier 1: Vessels associated with Moray East, Triton Knoll Tier 2: Vessels associated with the construction of Neart Na Gaoithe, Borselle 1, Borselle 2, Dieppe le Treport, Dogger Bank A, Dogger Bank B, Hornsea Project Two, Seagreen Alpha, Seagreen Bravo, Twinhub, Kaskasi, Vesterhav Nord/Sud, Calvados, Hollandse Kust Zuid Holland IV and III, Hollands Kust Nord, Hollandse Kust West Site VI, Hywind Tampen, Seagreen, Fair Head, Hollyhead Deep, Viking IC . Tier 3: Vessels associated with the construction Dogger Bank C, East Anglia One North, East Anglia Two, Bombora, Borkum Rifgrund 3, GoDe Wind 3, EnBw He Dreidt, Seatwirl S2, Forthwind Demo phase 1, Sofia, Inch Cape, East Anglia Three, Hornsea Three, Hornsea Four, Greenlink IC Tier 4: Vessels associated with the construction and operation of Awel y Mor, Erebus, Norfolk Boreas, Norfolk Vanguard, Perpetuus, AQUIND IC Tier 5: Vessels associated with the construction Five Estuaries, North Falls, Sheringham and Dudgeon Extensions, Berwick Bank, Morgan, Mona, Morecambe, Isle of Man, Dublin, Codling, NISA, Arklow Bank, Kinsale, Inis Ealga, Celtic sea array, North celtic sea, Blackwater, Llyr 1, Lyr 2, Llywelyn, Gwynt Glas, Petroc, Shelmalere. South Irish Sea, Greystones, Braymore wind park, North Channel 1, North Channel 2, Shearwater 1, Machair wind, Hesselo, Thor, Frederikshavn Demo, Outer Dowsing, Dunkerque, Ten Noorden van de Waddeneilanden, Hollandse Kust West Site VII, Dolphyn Project, Beech, Aspen, Clarus, West of Orkney, Caledonia. Tier 6: Princess Elizabeth Noorhinder Noord tender, N-3., N-3.8, N-7.2, Seismic surveys in the North Sea (x4 at any one time)	The identified projects are those within the MUs which may act cumulatively to increase the risk from vessels.

11.12.14 The CEA for marine mammals is set out in **Table 11-36**.

Table 11-36 Cumulative effects assessment for marine mammals

ID (Figure 5.4.1)	Development name	Assessment discussion	Environmental measures
W29	Hornsea Project Two	No spatial overlap or direct impact is expected. Indirect cumulative impact of underwater noise from projects listed.	Relevant embedded environmental measures as outlined in **Table 11-14** that focus on minimising underwater noise (C-52, C-54 and C-102), vessel collision risk (C-51), marine pollution (C-53), and environmental monitoring and management (C-95).
W40	Neart na Gaoithe		
W38	Moray East		
W6	Borselle I		
W7	Borselle 2		
W59	Triton Knoll		
W11	Dogger Bank A		
W12	Dogger Bank B		
W13	Dogger Bank C		
W56	Sofia		
W17	East Anglia Three		
W33	Inch Cape		
W52	Seagreen Alpha		
W53	Seagreen Bravo		
W30	Hornsea Three		
W27	Hornsea Four		
W42	Norfolk Vanguard		
W39	Moray West		
W41	Norfolk Boreas		
W16	East Anglia One North		
W18	East Anglia Two		
W1	Awel y Mor		

ID (Figure 5.4.1)	Development name	Assessment discussion	Environmental measures
W21	Five Estuaries (Galloper Extension)		
W43	North Falls (Greater Gabbard extension)		
W48	Rampion Offshore Wind Farm		
W55	Sheringham Shoal and Dudgeon extensions		
W10	Dieppe Le Treport		
W20	Fécamp		
W66	Berwick Bank		
W67	Morgan		
W65	Erebus		
W68	Mona		
W71	Dublin		
W73	NISA		
W74	Arklow		
W72	Codling		
T1	Perpetuus Tidal Energy Centre (PTEC)		
W69	Morcambe		
W70	isle of man		
W78	Kinsale		
W80	Inis Ealga		
W81	Celtic sea array		
W82	North Celtic sea		
W83	Blackwater		

ID (Figure 5.4.1)	Development name	Assessment discussion	Environmental measures
W86	Llyr 1		
W87	Llyr 2		
W88	Llywelyn		
W89	Gwynt glas		
W90	Petroc		
W91	Shelmalere		
W93	South Irish sea		
W96	Wicklow		
W98	Greystones		
W101	Braymore wind park		
W103	North channel wind 1		
W104	North channel wind 2		
W106	Shearwater One		
W107	Machair wind		
C4	Greenlink interconnector		
W111	Bombora		
W112	Twinhub		
W113	Princess Elizabeth Noorhinder Noord tender		
W114	Borkum rifgrund 3		
W115	GoDe wind 3		
W116	EnBw He Dreiht		
W117	N-3.7 (North sea cluster - gode wind)		
W118	N-3.8 (North sea cluster - Nordsee Two)		
W119	N-7.2		

ID (Figure 5.4.1)	Development name	Assessment discussion	Environmental measures
W120	Kaskasi		
W121	Hesselo		
W122	Thor		
W123	Frederikshavn offshore demo		
W124	Outer dowsing		
W125	Vesterhav Nord/Sud		
W126	Calvados		
W127	Saint Breuic		
W128	Dunkerque		
W129	Oriel		
W130	Hollandse Kust Zuid Holland I and II		
W131	Hollandse Kust Zuid III and IV		
W132	Hollandse Kust Noord		
W134	Hollandse Kust West Site VI		
W135	Ten noorden van de Waddeneilanden		
W136	Hollandse Kust West Site VII		
W137	Hywind Tampen		
W139	Seatwirl S2		
W140	Seagreen		
W141	Dolphyn project		
W142	Beech		
W154	Clarus		

ID (Figure 5.4.1)	Development name	Assessment discussion	Environmental measures
W159	West of Orkney		
W161	Caledonia		
T1	Perpetuus Tidal Energy Centre (PTEC)		
T2	Fair Head		
T3	Hollyhead Deep		
C1	AQUIND Interconnector		
C5	Viking Link Interconnector		

Cumulative increase in underwater noise during construction

11.12.15 UXOs and pile driving: Different OWF EIAs have assessed disturbance using a variety of thresholds and methods, including effective deterrence ranges, fixed noise thresholds and dose-response curves. This means that the predicted number of animals disturbed is not comparable between projects. In order to standardise the CEA approach, the assessment of disturbance from construction and decommissioning activities at OWF sites follows the advice provided in JNCC (2020) where unabated pile driving of a monopile and clearance of a UXO are both precited to have an Effective Deterrence Range (EDR) of 26km for harbour porpoise. In the absence of recommended EDRs for other species, this has been applied to all marine mammal species. In order to quantify the number of animals predicted to experience disturbance at each OWF project, the SCANS III density (Hammond *et al.,* 2017) for the corresponding survey block has been applied for each cetacean species. For floating OWFs, the same 26km EDR has been applied, under the assumption that the maximum design parameter for floating wind farms may include pile driven anchors. For tidal projects, a 5km EDR for construction related activities has been assumed since no pile driving is expected to occur.

11.12.16 Seismic surveys: The potential number of seismic surveys that could be undertaken is unknown. Therefore, it has been assumed that one seismic survey is conducted in the Irish Sea at any one time, and four seismic surveys are conducted within the North Sea at any one time (to account for concurrent surveys in the northern and southern North Sea in both UK waters and those of neighbouring North Sea nations). It has been assumed that the EDR for seismic surveys is 12 km as per the advice provided in JNCC (2020). It is considered that this approach is sufficiently precautionary (i.e. it is unlikely that this number of seismic surveys will be occurring concurrently, less so concurrently with Rampion 2 construction).

11.12.17 It is acknowledged that seismic surveys are a moving sound source and not a point source. Therefore, the approach presented in BEIS (2020) has been adopted here. Therefore it has been assumed that a seismic survey vessel travelling at 4.5 knots (8.3 km/h) could, in theory, survey a total of 199 km of survey line in a single 24 hr period and therefore impact an area of 4,294 km² per day (**Graphic 11-1**) To estimate the number of harbour porpoise and minke whales predicted to be disturbed from seismic surveys in the North Sea, the average density across the North Sea was calculated[4].

Graphic 11-1 Maximum worst-case theoretical area of impact over a single day from a seismic survey travelling at 4.5 knots using 12 km EDR (BEIS, 2020)

11.12.18 Cables: there is potential that the construction of the AQUIND, Greenlink and Viking inter-connector cables could involve the clearance of UXOs prior to cable construction/laying and therefore these developments have been included in both the assessment of cumulative increase in disturbance from underwater noise and the assessment of cumulative increase in vessel disturbance.

11.12.19 Oil and Gas: the projects listed in **Table 11-34** are being decommissioned between 2021 and 2031. The CEA focuses on projects during construction; therefore these developments have not been included in the assessment of cumulative increase in disturbance from underwater noise but is included in the assessment of cumulative increase in vessel disturbance.

11.12.20 Carbon capture: it is expected that the construction of carbon capture projects would not present a significant underwater sound source above the level of the associated vessel activity (see additional details in the construction noise assessment within **Section 11.9**). Therefore, developments have not been

[4] For harbour porpoise: SCANS III estimate for the North Sea = 0.52 porpoise/km². For minke whales: SCANS III estimate for the North Sea/575,000 km² = 0.015 whales/km²

included in the assessment of cumulative increase in disturbance from underwater noise but is included in the assessment of cumulative increase in vessel disturbance.

11.12.21 Tidal energy: for tidal projects it is assumed there is no pile driving, as a result construction related impacts are limited to a 5 km radius of the array area.

Harbour porpoise

11.12.22 Across all years considered in the CEA (2021-2030 inclusive) (**Table 11-37**), the year with the highest expected level of disturbance impact to harbour porpoise is 2025; this is the first year of construction work at Rampion 2, and therefore Rampion 2 is contributing to this disturbance level. During the five years when construction activity is assumed to occur at Rampion 2 (2025-2029 inclusive) the maximum number of porpoises predicted to be disturbed across all Tier 1-2 projects is between 2,682~~230~~ (0.86% MU) and across all Tier 1-6 projects is 465,349~~897~~ (13.42% MU) (**Table 11-38**).

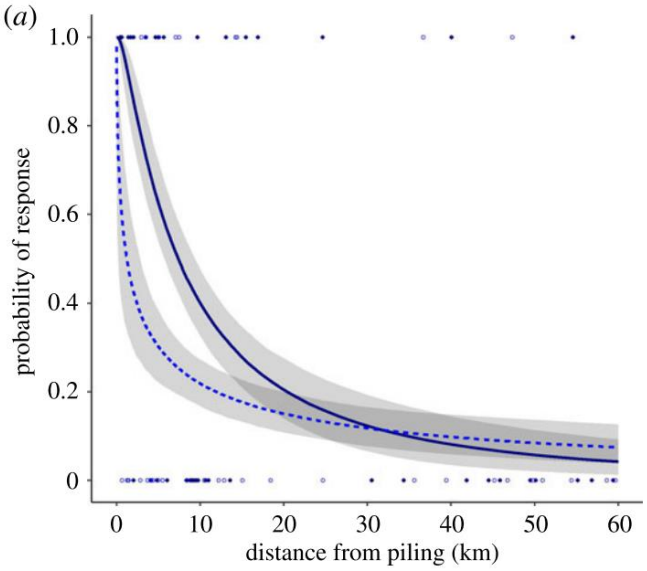
11.12.23 The relative contribution of impact from Rampion 2 is low compared to other developments included in the assessment. The predictions of the total number of animals disturbed is driven primarily by the developments in the southern North Sea in SCANS III Blocks O, N and L where harbour porpoise densities are much higher than in the English Channel. Additionally, the highest levels of impact are predicted for the seismic surveys which are assumed Tier 6 projects with no known information on timeline or survey methods and so are highly precautionary worst-case assumptions. In comparison to these projects, the number of porpoise disturbed at Rampion 2 is negligible.

11.12.24 There are significant levels of over-precaution built into this CEA which makes the resulting estimates highly precautionary and unrealistic. The main areas of precaution in the assessment include the following.

- The number of developments active at the same time (clearing UXOs, piling or surveying). In order for 465,34897~~7~~ porpoise to be disturbed across all Tier 1-6 projects in 2025, this would require that 25 offshore wind farm developments and 4 seismic surveys are all active at the same time. This is considered to be extremely unrealistic.
- The inclusion of lower tier developments. In reality, the best information in terms of construction timeline is available for Tier 1-2 projects which have consent and have secured a CfD. If only Tier 1-2 projects are included in the CEA then the maximum impact overlapping with the Rampion 2 construction period across all Tier 1-2 projects is disturbance to 2,682 ~~230~~ porpoise in total which is 0.86% of the MU (**Table 11-38**). There is less confidence in the timeline for Tier 3 projects as they have consent but have not secured CfD and so the construction timeline is less certain. If only Tier 1 - 3 projects are included in the CEA then the maximum impact overlapping with the Rampion 2 construction period across all projects is disturbance to 18,836~~1~~3 porpoise in total which is 5.43% of the MU (**Table 11-38**). By including projects that have no consent, no ES chapter or no submitted information at all (Tiers 4-6) then worst-case scenarios have to be assumed in the absence of other information, making the assessments highly precautionary.

- The assumption that UXO clearance or pile driving can occur at any point throughout the construction window for each development. This results in most projects having UXO and piling activities occurring over multiple consecutive years. For example, the construction window for Hornsea 4 is listed as 2025-2030 (which results in 6 years of impact) however, according to the Hornsea Four PEIR, piling would only occur within a 1 year period within this. Likewise, the information available for Inch Cape was “construction expected from 2021” with no end date provided, so it had to be assumed that construction could occur at any time after 2021. Since the exact timing of the UXO and piling activities within the respective development construction windows is unknown, it had to be assumed that it could occur at any point, thus resulting in piling schedules and subsequent disturbance levels that are far greater than would ever occur in reality.
- The impact area from seismic surveys. This approach was highlighted by BEIS (2020) as being highly precautionary and should be considered as an unrealistic worst-case scenario. This is mainly due to the fact that the approach does not take into consideration time when the seismic airguns are not firing within a survey day. Airguns are required to be turned off at the end of every survey line as the vessel turns, which can take 2-3 hours per turn and several turns can occur each day.
- The assumption that all developments will install pile driven monopile foundations. The project envelope for most of these developments includes options for pin-piles or monopiles. As a worst-case assumption monopiles have been assumed, however it is likely that a portion of these projects will use multileg foundations with pin-piles, which have a much lower recommended effective deterrence range (15 km instead of 26 km) (JNCC, 2020), and will therefore disturb far fewer porpoise (e.g. assuming a density of 0.888 porpoise/km^2 a 26 km radius impacts 1,886 porpoise, while a 15km radius impacts 628 porpoise).
- The assumption that all porpoise within a 26 km range are disturbed. Pile driving activities at other offshore wind farm have shown that this assumption of total displacement within 26 km of pile driving is a significant over-estimate. At Beatrice, there was only a 50% response at 7.4 km and 28% response within 26 km for the first location piled, with decreasing response levels over the construction period to 50% response at only 1.3 km by the final location (**Graphic 11-2**) (Graham *et al.,* 2019). Likewise, pile driving at the first 7 large scale offshore windfarms in the German Bight (including unmitigated piling) found declines in porpoise out to only 17 km (Brandt *et al.,* 2018).

Graphic 11-2 The probability of harbour porpoise response (24 h) in relation to the partial contribution of distance from piling for the first location piled (solid navy line) and the final location piled (dashed blue line) (Graham et al., 2019)



11.12.25 Although the estimate of cumulative impact of disturbance from underwater noise is considered to be highly precautionary (for the reasons listed above), there remains the potential for the cumulative increase in disturbance from construction activities across these developments to result in individuals experiencing multiple successive days of disturbance. Assuming that disturbance results in a period of zero energy intake, there is the potential for high levels of repeated disturbance to lead to a reduction in calf survival and potentially an effect on adult fertility (see Booth *et al.,* 2019 for further details). The number of animals predicted to be impacted (though acknowledging that this is a vast over-estimate) could potentially result in temporary changes in behaviour and/or distribution of individuals at a scale that would result in potential reductions to lifetime reproductive success to some individuals, although likely not enough to affect the population trajectory over a generational scale. For example, previous population modelling (using iPCoD) of offshore wind farms in eastern English waters has demonstrated low probabilities of population level impacts, even when 16 piling operations were modelled over a 12 year period (disturbing up to a total of 34,396 porpoise per day) (Booth *et al.,* 2017). Similarly, the DEPONS model found that the North Sea porpoise population was unlikely to be significantly impacted by construction of 65 wind farms, unless impact ranges were assumed to be significant (exceeding 50 km) (Nabe-Nielsen *et al.,* 2018). Therefore, given that impacts are likely not enough to affect the population trajectory over a generational scale, the magnitude of the cumulative increase in disturbance from construction activities is **Medium**.

11.12.26 As outlined in **Table 11-29** the sensitivity of harbour porpoise to disturbance from underwater noise such as pile driving is **Low** (for example, reproduction may be affected but animals are expected to be able to recover).

11.12.27 Overall, the sensitivity of harbour porpoise has been assessed as **Low** and the magnitude is predicted to be **Medium**. Therefore, the significance of the effect has

been predicted to be of **Minor Adverse Significance** which is **Not Significant** in EIA terms.

Table 11-37 Harbour porpoise CEA – number of porpoise predicted to be disturbed (per day) by construction activity at each development alongside ongoing seismic surveys in the North Sea

Project	Tier	Block	Density	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Rampion 2		C	0.213				~~452~~	452	452	452	452	452	
Hornsea 2	1	O	0.888	1886	1886	1886							
Near na Gaoithe	2	R	0.599	1272									
Moray West	2	S	0.152	323									
Borssele I	1	L	0.607	1289	1289								
Borssele II	1	L	0.607	1289	1289								
Triton Knoll	1	O	0.888	1886									
Dogger Bank A	2	O	0.888		1886	1886	1886						
Dogger Bank B	2	O	0.888		1886	1886	1886						
Dogger Bank C	3	N	0.837			1778	1778	1778	1778				
Sofia	3	O	0.888			1886	1886	1886	1886				
Inch Cape	3	R	0.599	1272	1272	1272	1272	1272	1272	1272	1272	1272	1272
Seagreen Alpha	2	R	0.599	1272	1272	1272							
Seagreen Bravo	2	R	0.599	1272	1272	1272							
Moray West	3	S	0.152		323	323	323						
East Anglia Three	3	L	0.607			1289	1289	1289	1289				
Hornsea Three	3	O	0.888				1886	1886	1886	1886	1886		
Hornsea Four	3	O	0.888					1886	1886	1886	1886	1886	1886
Norfolk Vanguard	4	L	0.607				1289	1289	1289	1289	1289		
Norfolk Boreas	4	O/L	0.888		1886	1886	1886	1886					
East Anglia One North	3	L	0.607			1289	1289	1289	1289				
East Anglia Two	3	L	0.607			1289	1289	1289	1289				
Dieppe-le-Treport	2	C	0.213	~~452~~	~~452~~	~~452~~	452	452	452				
Fecamp	2	C	0.213	452	452	452							

Project	Tier	Block	Density	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Five Estuaries	5	L	0.607								1289	1289	1289
North Falls	5	L	0.607						1289	1289	1289	1289	1289
Dudgeon Extension	4	O	0.888					1886	1886	1886	1886	1886	1886
Sherringham Extension	4	O	0.888					1886	1886	1886	1886	1886	1886
Outer Dowsing	5	O	0.888						1886	1886	1886	1886	1886
Berwick Bank	4	R	0.599				1272	1272	1272	1272	1272	1272	1272
Caledonia	5	S	0.152								323	323	323
West of Orkney	5	S	0.152								323	323	323
Princess elizabeth noorhinder noord tender	6	L	0.607					1289	1289				
Borkum Riffgrund	3	N	0.837			1778	1778	1778					
GoDE Wind 3	3	M	0.277			588							
EnBw-He-Dreidt	3	N	0.837				1778	1778					
N-3.7	6	M	0.277					588	588				
N-3.8	6	M	0.277					588	588	588			
N-7.2	6	N	0.837						1778				
Kaskai	1	M	0.277		588								
Thor	5	L	0.607				1289	1289	1290				
Vesterhav Nord/syd	2	P	0.823		1784								
Calvados	2	C	0.213		452	452	452						
Saint-Brieuc	2	C	0.213	452	452	452							
Dukerque	5	L	0.607					1289					
Hollandse Kust Zuid I and II	2	N	0.837	1778	1778	1778							
Hollandse Kust Zuid III and IV	2	N	0.837	1778	1778	1778							
Hollandse Kust Nord	2	N	0.837	1778	1778	1778							
Hollandse Kust West VI	2	N	0.837		1778	1778	1778	1778					
Hollandse Kust West VII	5	N	0.837							1778			

Project	Tier	Block	Density	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Ten noorden van de Waddeneilanden	5	N	0.837						1778				
Hywind Tampen	2	U	0.321		682								
Seatwirl S2	3	V	0.137			291							
Dolphyn	5	R	0.599					1272					
Beech	5	R	0.599				1272	1272	1272	1272			
Aspen	5	T	0.402				854	854	854	854			
Forthwind Demo Phase 1	3	R	0.599				1272						
Viking IC	2	O/N/M	0.888	1886	1886	1886							
Aquind IC	4	C	0.213				452						
Perpetuus Tidal Energy Centre	4	C	0.213			17	17						
Seismic 1	6	Avg North Sea	0.52	2719	2719	2719	2719	2719	2719	2719	2719	2719	2719
Seismic 2	6	Avg North Sea	0.52	2719	2719	2719	2719	2719	2719	2719	2719	2719	2719
Seismic 3	6	Avg North Sea	0.52	2719	2719	2719	2719	2719	2719	2719	2719	2719	2719
Seismic 4	6	Avg North Sea	0.52	2719	2719	2719	2719	2719	2719	2719	2719	2719	2719

SCANS III density estimate (porpoise/km2): Block C = 0.213, Block L = 0.607, Block N = 0.837, Block O = 0.888, Block R = 0.599, Block S = 0.152, Average North Sea = 0.52 (Hammond et al., 2021)
Assumes a 26 km effective deterrence range for both UXO clearance and pile driving (JNCC, 2020)
Assumes a 12 km effective deterrence range for seismic surveys, assuming a survey vessel can travel 199 km in 1 day (JNCC, 2020, BEIS, 2020)
Assumes a 5 km effective deterrence range for tidal energy

Table 11-38 Harbour porpoise CEA – total underwater noise disturbance estimates across the Tiers

	Tier 1-2		Tier 1-3		Tier 1-4		Tier 1-6	
	Total	**% MU**	**Total**	**% MU**	**Total**	**% MU**	**Total**	**% MU**
2021	18,6139,065	5.45%	19,885 20,337	5.79%	19,885 20,337	5.79%	30,761 1,213	8.9.0%
2022	24,118640	7.01%	25,783 6,235	7.46%	27,669 8,121	8.01%	38,545 997	11.13%
2023	18,5569,008	5.45%	30,339 791	8.89%	32,225,677	9.34%	43,118 570	12.46%
2024	6,454454	1.91.9%	22,294 294	6.44%	27,210 210	7.97.9 %	41,501 501	12.00%
2025	2,682230	0.86%	18,813 361	5.43%	27,032 6,580	7.87%	46,349 5,897	13.42%
2026	904452	0.31%	13,479 027	3.98%	19,812 360	5.76%	43,299 2,847	12.54%
2027	452	0.1%	5,496	1.6%	11,829	3.4%	30,372	8.8%
2028	4520	0.10%	5,496044	1.65%	11,829 377	3.43%	27,815 363	8.07.9 %
2029	4520	0.10%	3,610158	1.0.9%	8,654202	2.54%	24,640 188	7.10%
2030	0	0.0%	3,158	0.9%	8,202	2.4%	24,118	7.0%
Min	**0**	**0.0%**	**3,158**	**0.9%**	**8,202**	**2.4%**	**24,118**	**7.0%**
Mean	**7,27530**	**2.1%**	**14,835 790**	**4.3%**	**19,435 390**	**5.6%**	**35,059 14**	**10.1%**
Max	**24,188,640**	**7.01%**	**30,339 791**	**8.89%**	**32,225 677**	**9.34%**	**46,349 5,897**	**13.42%**

Minke whale

11.12.28 Across all years considered in the CEA (2021-2030 inclusive) (**Table 11-39**), the years with the highest expected level of disturbance impact to minke whales are 2025 and 2026 which are the first and second year of construction work at Rampion 2, and therefore Rampion 2 is contributing to this disturbance level.

During the four years when construction activity could occur at Rampion 2 (2025-2029 inclusive) the maximum number of minke whales predicted to be disturbed across all Tier 1-2 projects is between 4 and 751 (0.02% and 0.4% MU) and across all Tier 1-6 projects is between 1,2344 and 1,3247 (6.1% and 6.6% MU) (**Table 11-40**).

11.12.29 The relative contribution of impact from Rampion 2 is low compared to other developments included in the assessment. The predictions of the total number of animals disturbed is driven primarily by the developments in the mid-northern North Sea in SCANS III Blocks O, N, R and S where minke whale densities are much higher than in the English Channel. Additionally, high levels of impact are predicted for the seismic surveys which are assumed Tier 6 projects with no known information on timeline or survey methods and so are highly precautionary worst-case assumptions. In comparison to these projects, the number of whales disturbed at Rampion 2 is negligible.

11.12.30 As per the harbour porpoise CEA assessment, there are significant levels of over-precaution built into this CEA which makes the resulting estimates highly precautionary and unrealistic. These precautions are stated above for harbour porpoise and similarly apply for minke whales. In addition to the precautions listed above for harbour porpoise, there is uncertainty for minke whales since there is no suggested EDR for UXO, pile driving or seismic surveys for this species as empirical data on their responses is lacking. Additionally, it is important to note that minke whales are not expected to be present year-round in the English Channel or the North Sea and therefore activities occurring outside of the summer months are expected to have no effect on the minke whale population as they are not likely to be present.

11.12.31 Although the estimate of cumulative impact of disturbance from underwater noise is considered to be highly precautionary (for the reasons listed above), there is the potential for the cumulative increase in disturbance from construction activities across these developments to result in individuals experiencing multiple successive days of disturbance. However, since minke whales are not expected to be present outside of the summer season, their exposure to disturbance impacts is limited and therefore it is expected that the level of impact they are potentially exposed to during the summer season is likely not enough to affect the population trajectory. Therefore, the magnitude of the cumulative increase in disturbance from construction activities is **medium**.

11.12.32 As outlined in **Table 11-29** the sensitivity of minke whales to disturbance from underwater noise such as pile driving is **low** (for example, reproduction may be affected but animals are expected to be able to recover).

11.12.33 Overall, the sensitivity of minke whales has been assessed as **low** and the magnitude is predicted to be **medium**. Therefore, the significance of the effect has been predicted to be of **minor adverse significance** which is **not significant** in EIA terms.

Table 11-39 Minke whale CEA – number of minke whales predicted to be disturbed (per day) by construction activity at each development alongside ongoing seismic surveys in the North Sea and Celtic/Irish Seas

	Rampion 2	Hornsea 2	Neart na Gaoithe	Moray East	Triton Knoll	Dogger Bank A	Dogger Bank B	Dogger Bank C	Sofia	Inch Cape	Seagreen Alpha	Seagreen Bravo	Moray West	Hornsea 3	Hornsea 4	Norfolk Boreas	Dieppe - Le Treport	Fécamp	SS & D Extensions	Awel y mor	Perpetuus Tidal Energy Centre	Outer Dowsing	Berwick Bank	Dublin	Codling	NISA	Arklow	Erebus	Oriel	Twinhub	Viking IC	AQUIND IC	Greenlink IC
Tier		1	2	2	1	2	2	3	3	3	2	2	3	3	3	4	2	2	4	4	2	5	4	5	5	5	5	3	5	2	2	4	3
Block	C	O	R	S	O	O	O	N	O	R	R	R	S	O	O	O	C	C	O	F	C	E	R	E	E	E	E	D	E	D	O/N /M	C	D
2021		21	83	21	21					83	83	83					4	4													43		
2022		21			21	21				83	83	83	21			21	4	4													43		
2023		21			21	21	42	21		83	83	83	21			21	4	4			5								37		43		
2024	4				21	21	42	21		83			21	21		21	4				5		83		37				37	1		4	24
2025	4						42	21		83				21	21	21	4		21				83	37	37	37	37			1			
2026	4						42	21		83				21	21		4		21			21	83	37	37	37	37	24					

	Rampion 2	Hornsea 2	Neart na Gaoithe	Moray East	Triton Knoll	Dogger Bank A	Dogger Bank B	Dogger Bank C	Sofia	Inch Cape	Seagreen Alpha	Seagreen Bravo	Moray West	Hornsea 3	Hornsea 4	Norfolk Boreas	Dieppe - Le Treport	Fécamp	SS & D Extensions	Awel y mor	Perpetuus Tidal Energy Centre	Outer Dowsing	Berwick Bank	Dublin	Codling	NISA	Arklow	Erebus	Oriel	Twinhub	Viking IC	AQUIND IC	Greenlink IC
2027	4									83				21	21				21			21	83				37						
2028	4									83				21	21				21	0		21	83										
2029	4									83					21				21	0		21	83										
2030										83					21				21	0		21	83										

SCANS III density estimate (porpoise/km^2): Block C = 0.213, Block L = 0.607, Block N = 0.837, Block O = 0.888, Block R = 0.599, Block S = 0.152, Average North Sea = 0.52 (Hammond *et al.,* 2017)
Assumes a 26 km effective deterrence range for both UXO clearance and pile driving (JNCC, 2020)
Assumes a 12 km effective deterrence range for seismic surveys, assuming a survey vessel can travel 199 km in 1 day (JNCC, 2020, BEIS, 2020)
Assumes a 5 km effective deterrence range for tidal energy

	Kinsale	Inis Ealga	Celtic Sea Array	North Celtic Sea	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Shelmalere	South Irish Sea	Wicklow	Greystones	Braymore	North Channel Wind 1	North Channel Wind 2	Shearwater Wind 1	Machair Wind	Bombora	Bokrum Rifgrund 3	EnBw He Dreiht	N-7.2	Vesterhav	Calvados	Saint Breuic	Hollandse Kust I & II	Hollandse Kust III & IV	Hollandse Kust Nord	Hollandse Kust VI	Hollandse Kust VII
Tier	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	3	6	2	2	2	2	2	2	2	5
Block	8	4+8	4+8	8	4	D	D	D	D	D	E	E	E	E	E	G	E	G	G	D	N	N	N	P	C	C	N	N	N	N	N
2021																										5	43	43	43		
2022																1								20	5	5	43	43	43	43	
2023																1	43								5	5	43	43	43	43	
2024															58		43	43							5					43	
2025							24	24							58		43	43												43	
2026			37				24	24				37		58	58				43												43

	Kinsale	Inis Ealga	Celtic Sea Array	North Celtic Sea	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Shelmalere	South Irish Sea	Wicklow	Greystones	Braymore	North Channel Wind 1	North Channel Wind 2	Shearwater Wind 1	Machair Wind	Bombora	Bokrum Rifgrund 3	EnBw He Dreiht	N-7.2	Vesterhav	Calvados	Saint Breuic	Hollandse Kust I & II	Hollandse Kust III & IV	Hollandse Kust Nord	Hollandse Kust VI	Hollandse Kust VII
2027			44	37	6			24		24		37		37	37	58	37	58	58												
2028	37	44	44	37	6			24	24	24	37	37	37	37	37	58	37	58													
2029	37	44	44	37	6			24	24	24	37	37	37	37	37	58	37	58													
2030	37	44	44	37	6			24	24	24	37	37	37	37	37	58	37														

	Ten noorden van de Waddeneilanden	Hywind Tampen	Seatwirl S2	Seagreen	Dolphyn	Beech	Aspen	Forthwind Demo	Fair Head	Hollyhead deep	Clarus	Caledonia	West of Orkney	Seismic 1 NS	Seismic 2 NS	Seismic 3 NS	Seismic 4 NS	Seismic 1 C+I Seas
Tier	5	2	3	2	5	5	5	3	2	3	5	5	5	6	6	6	6	6
Block	N	N	N	U	V	R	R	R	T	R	G	E	7	S	S	Average North Sea		C+ I
2021				82					2					81	81	81	81	20
2022		32		82					2	1				81	81	81	81	20
2023			24	82										81	81	81	81	20
2024						82	67	82						81	81	81	81	20
2025					82	82	67							81	81	81	81	20
2026						82	67							81	81	81	81	20

	Ten noorden van de Waddeneilanden	Hywind Tampen	Seatwirl S2	Seagreen	Dolphyn	Beech	Aspen	Forthwind Demo	Fair Head	Hollyhead deep	Clarus	Caledonia	West of Orkney	Seismic 1 NS	Seismic 2 NS	Seismic 3 NS	Seismic 4 NS	Seismic 1 C+I Seas
2027	43					82	67							81	81	81	81	20
2028											16	21	21	81	81	81	81	20
2029											16	21	21	81	81	81	81	20
2030											16	21	21	81	81	81	81	20

SCANS III density estimate (porpoise/km^2): Block C = 0.213, Block L = 0.607, Block N = 0.837, Block O = 0.888, Block R = 0.599, Block S = 0.152, Average North Sea = 0.52 (Hammond *et al.,* 2017)
Assumes a 26km effective deterrence range for both UXO clearance and pile driving (JNCC, 2020)
Assumes a 12km effective deterrence range for seismic surveys, assuming a survey vessel can travel 199 km in 1 day (JNCC, 2020, BEIS, 2020)
Assumes a 5km effective deterrence range for tidal energy

Table 11-40 Minke whale CEA – total underwater noise disturbance estimates across the Tiers

	Tier 1-2		Tier 1-3		Tier 1-4		Tier 1-6	
	Total	**% MU**	**Total**	**% MU**	**Total**	**% MU**	**Total**	**% MU**
2021	6015	3.0%	6848	3.4%	6848	3.4%	1,02832	5.1%
2022	61822	3.1%	7248	3.6%	7459	3.7%	1,08993	5.4%
2023	5648	2.8%	799803	4.01%	8204	4.1%	1,2015	6.0%
2024	118114	0.6%	498494	2.5%	60602	3.0%	1,23127	6.1%
2025	751	0.4%	3495	1.7%	4951	2.54%	1,3240	6.6%
2026	84	0.042%	2201902	1.10%	3451	1.7%	1,33127	6.6%
2027	4	0.02%	129	0.6%	254	1.3%	1,305	6.5%
2028	4	0.02%	1259	0.6%	2544	1.3%	1,2555	6.2%
2029	4	0.02%	10829	0.56%	23333	1.2%	1,2344	6.1%
2030	0	0.0%	104	0.5%	229	1.1%	1,172	5.8%
Min	**0**	**0.0%**	**104**	**0.5%**	**229**	**1.1%**	**1,02832**	**51%**
Mean	**200200**	**1.0%**	**374**	**1.9%**	**4677**	**2.3%**	**1,217**	**6.0%**
Max	**61822**	**3.1%**	**799803**	**4.0%**	**8204**	**4.1%**	**1,33127**	**6.6%**

Bottlenose dolphin

11.12.34 Across all years considered in the CEA (2021-2030 inclusive) (**Table 11-42**), the year with the highest expected level of disturbance impact to bottlenose dolphins is 2026 which is the second year of construction work at Rampion 2, and therefore Rampion 2 is contributing to this disturbance level. During the four years when

construction activity could occur at Rampion 2 (2025-2028 inclusive) the maximum number of bottlenose dolphins predicted to be disturbed across all Tier 1-2 projects is between 1269 and 2547 (1.12% and 2.3% MU) and across all Tier 1-6 projects is between 559 21 and 727730 (5.14.9% and 6.66.7% MU) (**Table 11-42**).

11.12.35 As per the harbour porpoise CEA assessment, there are significant levels of over-precaution built into this CEA which makes the resulting estimates highly precautionary and unrealistic. These precautions are stated above for harbour porpoise and similarly apply for bottlenose dolphins. In addition to the precautions listed above for harbour porpoise, bottlenose dolphins are not expected to be present year-round in the English Channel in high densities as SCANS-III survey block C recorded a density of 0.000 individuals/km2, and therefore activities occurring are expected to have little effect on the bottlenose dolphin population as they are not likely to be present in high densities.

11.12.36 As stated above, although the estimate of cumulative impact of disturbance from underwater noise is considered to be highly precautionary, there is the potential for the cumulative increase in disturbance from construction activities across these developments to result in individuals experiencing multiple successive days of disturbance. However, since bottlenose dolphins are not expected to be in high densities, their exposure to disturbance impacts is limited and therefore it is expected that the level of impact they are potentially exposed to is likely not enough to affect the population trajectory. The maximum percentage of the MU impacted when Rampion 2 is piling, and including projects in Tiers 1-6, is 6.7% (**Table 11-42**). Therefore, the magnitude of the cumulative increase in disturbance from construction activities is **medium**.

11.12.37 As outlined in **Table 11-29** the sensitivity of bottlenose dolphins to disturbance from underwater noise such as pile driving is **low** (for example, reproduction may be affected but animals are expected to be able to recover).

11.12.38 Overall, the sensitivity of bottlenose dolphins has been assessed as **low** and the magnitude is predicted to be **medium**. Therefore, the significance of the effect has been predicted to be of **minor adverse significance** which is **Not Significant** in EIA terms.

Table 11-41 Bottlenose dolphin CEA – number of dolphins predicted to be disturbed (per day) by construction activity at each development alongside ongoing seismic surveys in Celtic/Irish Seas

	Rampion 2	Dieppe le Treport	Fecamp	Perpetuus	Erebus	Twinhub	Kinsale	Inis Ealga	Celtic Sea Array	North Celtic Sea	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Bombora	Calvados	Saint Breuic	AQUIND IC	Greenlink IC	Seismic C+I Seas
Tier		2	2	4	3	2	5	5	5	5	5	5	5	5	5	5	3	2	2	4	2	4
Block	C	C	C	C	D	D	8	4+8	4+8	8	4	D	D	D	D	D	D	C	C	C	C	D	C+I Sea
2021		~~0~~	0			128													0			49
2022		~~0~~	0			128											5	0	0			49
2023		~~0~~	0	0		128											5	0	0			49
2024	~~126*~~	0		0		128												0		0	128	49

	Rampion 2	Dieppe le Treport	Fecamp	Perpetuus	Erebus	Twinhub	Kinsale	Inis Ealga	Celtic Sea Array	North Celtic Sea	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Bombora	Calvados	Saint Breuic	AQUIND IC	Greenlink IC	Seismic C+I Seas
2025	126*	0				128						128	128									49
2026	126*	0			128					37		128	128									49
2027	126*								44	37	6			128		128						49
2028	126*						37	44	44	37	6			128	128	128						49
2029	126*						37	44	44	37	6			128	128	128						49
2030							37	44	44	37	6			128	128	128						49

Assumes a 26 km effective deterrence range for both UXO clearance and pile driving (JNCC, 2020)
Assumes a 12 km effective deterrence range for seismic surveys, assuming a survey vessel can travel 199 km in 1 day (JNCC, 2020, BEIS, 2020)
Assumes a 5 km effective deterrence range for tidal energy

	Rampion 2	Dieppe le Treport	Fecamp	Perpetuus	Erebus	Twinhub	Kinsale	Inis Ealga	Celtic Sea Array	North Celtic Sea	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Bombora	Calvados	Saint Breuic	AQUIND IC	Greenlink IC	Seismic C+I Seas

*Whilst the density for bottlenose dolphins in Block C is 0.000 animals/km^2, as the number of individuals disturbed is predicted in **Table 11-27** the worst-case number of individuals from a single piling location in this CIA has been used

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Table 11-42 Bottlenose dolphin CEA – total underwater noise disturbance estimates across the Tiers

	Tier 1-2		Tier 1-3		Tier 1-4		Tier 1-6	
	Total	**% MU**	**Total**	**% MU**	**Total**	**% MU**	**Total**	**% MU**
2021	128	1.2%	128	1.2%	128	1.2%	177	1.6%
2022	128	1.2%	133	1.2%	133	1.2%	182	1.7%
2023	128	1.2%	133	1.2%	133	1.2%	182	1.7%
2024	128	1.2%	256	2.3%	256	3.5%	305	2.8%
2025	2547	2.3%	2547	2.3%	2547	2.3%	55962	5.1%
2026	126129	1.21.2%	2547	2.3%	2547	2.3%	59699	5.5%
2027	1269	1.22%	1269	1.2%	1269	1.2%	51821	4.78%
2028	126129	1.21.2%	126129	1.21.2%	126129	1.21.2%	727730	6.67%
2029	126129	1.21.2%	126129	1.21.2%	126129	1.21.2%	727730	6.67%
2030	0	0.0%	00	0.0%0.0%	0	0.0%	601	5.5%
Min	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**177**	**1.6%**
Mean	**12729**	**1.22%**	**15455**	**1.4.4%**	**15455**	**1.44%**	**45759**	**42.1%**
Max	**2547**	**2.3%**	**256257**	**2.32.3%**	**256257**	**2.32.3%**	**727730**	**6.66.7%**

Common dolphin

11.12.39 Across all years considered in the CEA (2021-2030 inclusive) (**Table 11-43**), the year with the highest expected level of disturbance impact to common dolphins is 2027 which is the third year of construction work at Rampion 2, and therefore Rampion 2 is contributing to this disturbance level. During the four years when construction activity could occur at Rampion 2 (2025-2028 inclusive) the maximum number of common dolphins predicted to be disturbed across all Tier 1-2 projects is between 582 and 661 (0.6% MU) and across all Tier 1-6 projects is between 1094 and 1665 (1.1% and 1.6% MU) (**Table 11-44**).

11.12.40 As per the harbour porpoise CEA assessment, there are significant levels of over-precaution built into this CEA which makes the resulting estimates highly precautionary and unrealistic. These precautions are stated above for harbour porpoise and similarly apply for common dolphins. In addition to the precautions listed above for harbour porpoise, common dolphins are not expected to be present in the English Channel in high densities as SCANS-III survey block C recorded a density of 0.000 individuals/km2, and therefore activities occurring are expected to have little effect on the common dolphin population.

11.12.41 As described above, although the estimate of cumulative impact of disturbance from underwater noise is considered to be highly precautionary, there is the potential for the cumulative increase in disturbance from construction activities across these developments to result in individuals experiencing multiple successive days of disturbance. However, since common dolphins are not expected to be in high densities, their exposure to disturbance impacts is limited and therefore it is expected that the level of impact they are potentially exposed to is likely not enough to affect the population trajectory. The maximum percentage of the MU impacted when Rampion 2 is piling, and including projects in Tiers 1-6, is 1.6% (**Table 11-44**). Therefore, the magnitude of the cumulative increase in disturbance from construction activities is **low**.

11.12.42 As outlined in **Table 11-29** the sensitivity of bottlenose dolphins to disturbance from underwater noise such as pile driving is **low** (for example, reproduction may be affected but animals are expected to be able to recover).

11.12.43 Overall, the sensitivity of common dolphins has been assessed as **low** and the magnitude is predicted to be **low**. Therefore, the significance of the effect has been predicted to be of **minor adverse significance** which is **Not Significant** in EIA terms.

Table 11-43 Common dolphin CEA – number of porpoise predicted to be disturbed (per day) by construction activity at each development alongside ongoing seismic surveys in the Irish/Celtic Sea

	Rampion 2	Erebus	Inis Ealga	Celtic Sea Array	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Twinhub	Bombora	Clarus	Greenlink IC	Seismic C+I Seas
Tier		3	5	5	5	5	5	5	5	5	2	3	5	2	6
Block	C	D	4+8	4+8	4	D	D	D	D	D	D	D	7	D	C+I sea
2021											79				275
2022											79	3			275
2023											79	3			275
2024	~~582*~~										79			79	275
2025	582*					79	79				79				275

	Rampion 2	Erebus	Inis Ealga	Celtic Sea Array	Blackwater	Llyr 1	Llyr 2	Llywelyn	Gwynt Glas	Petroc	Twinhub	Bombora	Clarus	Greenlink IC	Seismic C+I Seas
2026	582*	79				79	79			79					275
2027	582*			149	149			79		79					275
2028	582*		149	149	149			79	79	79			124		275
2029	582*		149	149	149			79	79	79			124		275
2030			149	149	149			79	79	79			124		275

Assumes a 26km effective deterrence range for both UXO clearance and pile driving (JNCC, 2020)
Assumes a 12km effective deterrence range for seismic surveys, assuming a survey vessel can travel 199 km in 1 day (JNCC, 2020, BEIS, 2020)
Assumes a 5km effective deterrence range for tidal energy

*Whilst the density for bottlenose dolphins in Block C is 0.000 animals/km2, as the number of individuals disturbed is predicted in **Table 11-27** the worst-case number of individuals from a single piling location in this CIA has been used

Table 11-44 Common dolphin CEA – total underwater noise disturbance estimates across the Tiers

	Tier 1-2		Tier 1-3		Tier 1-4		Tier 1-6	
	Total	**% MU**	**Total**	**% MU**	**Total**	**% MU**	**Total**	**% MU**
2021	79	0.1%	79	0.1%	79	0.1%	354	0.3%
2022	79	0.1%	82	0.1%	82	0.1%	357	0.3%
2023	79	0.1%	82	0.1%	82	0.1%	357	0.3%
2024	79	0.1%	158	0.2%	158	0.2%	433	0.4%
2025	661	0.6%	661	0.6%	661	0.6%	1094	1.1%
2026	582	0.6%	661	0.6%	661	0.6%	1094	1.1%
2027	582	0.6%	582	0.6%	582	0.6%	1313	1.3%
2028	582	0.6%	582	0.6%	582	0.6%	16650~~83~~	1.6~~1~~%
2029	582	0.6%	582	0.6%	582	0.6%	1665	1.6%
2030	0	0.0%	0	0.0%	0	0.0%	1083	1.1%
Min	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**354**	**0.3%**
Mean	**331**	**0.3%**	**347**	**0.3%**	**347**	**0.3%**	**942**	**0.9%**
Max	**661**	**0.6%**	**661**	**0.6%**	**661**	**0.6%**	**1665**	**1.6%**

Cumulative increase in vessel disturbance

11.12.44 There is a potential risk of other projects within the marine mammal ZOI to increase the total number of vessels within the vicinity, greater than that caused by construction activities on the Proposed Development alone. This cumulative assessment considers the increased potential for disturbance to marine mammals due to the potential increase in vessel movements from the construction of the proposed development with other planned or existing projects, plans and activities. Projects were screened out of the assessment where they were already active or operational as they were considered to be part of the baseline.

11.12.45 Harbour porpoise, common dolphin, bottlenose dolphin and minke whale: The list of projects screened into the assessment were all located in the North Sea and, therefore, were located within the harbour porpoise MU (North Sea) and the

relevant MUs for common dolphins and minke whales (Celtic and Greater North Seas) and Offshore Channel MU for bottlenose dolphin (**Table 11-45**).

11.12.46 Grey and harbour seals: The list of projects screened into the assessment were all located North Sea and Channel and, therefore, were located in the relevant MUs for grey and harbour seals (South England MU and Southeast England MU (**Table 11-45**).

11.12.47 The potential for cumulative vessel disturbance during the operational phase has not been assessed as the expected levels of vessel activity for Rampion 2 and other projects are considerably lower than during construction, for example at Rampion 2 44 vessels will be required just for WTG installation alone during construction phase, whilst during the operation it is expected 21 vessels will be required. Rampion 2 has committed to a VMP (C-51) and adherence to the MWWC as part of that commitment and expects all other projects to have committed to the same conditions to minimise disturbance.

11.12.48 **Table 11-46** presents the quantitative information that is available for all projects screened into the CEA for vessel disturbance, covering the construction, operation and maintenance and decommissioning (Oil and Gas projects) phase vessel numbers and movements expected for each project.

11.12.49 In general, it is extremely difficult to reliably quantify the level of increased disturbance to marine mammals resulting from increased vessel activity on a cumulative basis given the large degree of temporal and spatial variation in vessel movements between projects and regions, coupled with the spatial and temporal variation in marine mammal movements across the region. Vessel routes to and from offshore windfarms and other projects will, for the majority, use existing vessel routes for pre-existing vessel traffic which marine mammals will be accustomed to. They may also have become habituated to the volume of regular vessel movements and therefore the additional risk is confined predominantly to construction sites. The Vessel movements within construction areas for both offshore wind farms and interconnector cables are likely to be limited and relatively slow, resulting in less risk to marine mammal receptors. In addition, most projects are likely to adopt VMPs in order to minimise any potential effects on marine mammals. The only known activity that may not follow pre-existing vessel traffic routes are seismic surveys, so may risk adding vessel presence to novel areas, however these operate their own mitigation measures to protect marine mammals (for example, see JNCC *et al.,* 2010, 2017 – while mitigating for PTS the measures outlined in these guidance documents will also reduce disturbance impacts). Therefore, increases in disturbance from vessels from offshore projects are likely to be small in relation to current and ongoing levels of shipping.

11.12.50 For all marine mammal receptors, the cumulative impact of increased disturbance from vessels is predicted to be of local spatial extent, long-term duration (vessel presence expected throughout the lifespan of a windfarm), intermittent (vessel activity will not be constant) and reversible (disturbance effects are temporary). Therefore, the magnitude of vessel disturbance is considered to be minor, indicating that the potential is for short-term and/or intermittent behavioural effects, with survival and reproductive rates very unlikely to be impacted to the extent that the population trajectory would be altered. It is anticipated that any animals displaced from the area will return when vessel disturbance has ended.

11.12.51 Overall, the sensitivity of all marine mammals to vessel disturbance has been assessed as **very low** (see **paragraph 11.9.69**) and the magnitude of the cumulative increase in vessel disturbance is predicted to be **low**. Therefore, the effect is of **negligible** significance, which is **Not Significant** in EIA terms.

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Table 11-45 Projects considered within the marine mammal CEA for disturbance from vessel activity

	Rampion 2	Hornsea 2	Neart na Gaoithe	Moray East	Borssele I	Borssele II	Triton Knoll	Dogger Bank A	Dogger Bank B	Dogger Bank C	Sofia	Inch Cape	Seagreen Alpha	Seagreen Bravo	Moray West	East Anglia 3	Hornsea 3	Hornsea 4	Norfolk Vanguard	Norfolk Boreas	East Anglia 1N	East Anglia 2	North Falls	SS & D Extensions	Outer Dowsing	Perpetuus	Berwick Bank	Morgan	Mona	Morecambe	Isle of Man	Dublin	Codling	NISA	Arklow	Erebus	Oriel	Twinhub	Greenlink IC	Endurance Carbon Capture	Johnston WHPS	Johnston template/ manifold
Tier		1	2	2	1	1	1	2	2	3	3	3	2	2	2	3	3	3	4	4	3	3	5	4	5	4	4	5	5	5	5	5	5	5	5	3	5	5	3	5	5	5
2024	C	O	O	O	O	O	O	C	C	C	C	C	O	O	C	C	C		C	C	C	C				C	C					C				C	C	C	C	D	D
2025								O	O									C					C		O	C	C	C			C	C	C	C		O	C	O	C	D	D
2026															O		C			O		C	C		O	C	C	C	C	C	C	C	C	C	O	O	O	C	D	D
2027										O	O					O					O	O	C	C	C	O	C	C	C	C	C	O	O	O	C	O	O	O	O	D	D
HP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
MW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BD	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
CD	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GS	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y
HS	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y

C = Construction phase vessels screened in, O = operation and maintenance phase vessels screened in, D = decommissioning phase screened in
HP = harbour porpoise, MW = minke whale, BD = bottlenose dolphin and CD = common dolphin, GS = grey seal, HS = harbour seal
Y = within MU, N = not in MU

	North Celtic Sea	Blackwater	Lly1	Llyr2	Llywelyn	Petroc	South Irish Sea	Greystones	Braymore	North channel	Shearwater 1	Machair wind	Borkum Rifgrund	EnBw He Dreiht	Hesselo	Thor	Calvados	Dunkerque	Hollandse Kust West Site VI	Dolphyn	Beech	Aspen	AQUIND IC	Greenlink IC
Tier	5	5	5	5	5	5	5	5	5	5	5	5	3	3	5	5	2	5	5	5	5	5	4	3
2024												C	C	C		C	C		C		C	C	C	C
2025			C	C								C	C	C		C	O	C	C	C	C	C	O	O
2026			C	C			C				C	C	O	O	C	O	O	O	O	O	C	C	O	O
2027	C	C	O	O	C	C	C	C	C	C	C	C	O	O	C	O	O	O	O	O	C	C	O	O
HP	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
MW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BD	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y
CD	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
HS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

C = Construction phase vessels screened in, O = operation and maintenance phase vessels screened in, D = decommissioning phase screened in
HP = harbour porpoise, MW = minke whale, BD = bottlenose dolphin and CD = common dolphin, GS = grey seal, HS = harbour seal
Y = within MU, N = not in MU

Table 11-46 Level of vessel activity anticipated for each project included in the marine mammal CEA (NS = information not stated in project species impact assessment)

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Hornsea Project Two	Construction screened out – completed before Rampion 2 construction commences – no overlap		22	2,817	NA
Neart na Gaoithe			NS	NS	Number of vessels and trips during operation and maintenance not available.
Moray East			NS	NS	Number of vessels and trips during operation and maintenance is still to be confirmed but will be less than during construction.
Borssele I			NS	NS	Number of vessels and trips during operation and maintenance not available.
Borssele II			NS	NS	Number of vessels and trips during operation and maintenance not available.
Triton Knoll			NS	18,440	Number of vessels during operation and maintenance not available.

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Dogger Bank A	264 (66 per 4 concurrent projects)	3,460	28	683	Max 66 vessels offshore per project during construction (peak in year 2). Max 28 vessels offshore per project during operation and maintenance. Dogger Bank A and B may be constructed in isolation, sequentially or concurrently. Therefore operation and maintenance may occur in isolation or concurrently depending on construction.
Dogger Bank B	264 (66 per 4 concurrent projects)	3,460	28	683	
Dogger Bank C	396 (66 per 6 concurrent projects)	5,810	39	4015	Max 66 vessels offshore per project during construction. Dogger Bank C and Sofia may be constructed in isolation, sequentially or concurrently. Therefore operation and maintenance may occur in isolation or concurrently depending on construction.
Sofia	396 (66 per 6 concurrent projects)	5,810	39	4015	
East Anglia Three	45	5,810	13	4,067	Estimated 2 service vessels offshore per day.
Inch Cape	NS	3,500	Operation and maintenance screened out		Number of vessels during construction not available.
Seagreen Alpha	Construction screened out – completed before Rampion 2		NS	NS	Up to 2 vessels on site at a time. May operate in isolation of

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Seagreen Bravo	construction commences – no overlap		NS	NS	concurrently with Seagreen Bravo, depending on construction schedule. Number of vessels and trips during operation and maintenance not available. Up to 2 vessels on site at a time. May operate in isolation of concurrently with Seagreen Alpha, depending on construction schedule. Number of vessels and trips during operation and maintenance not available.
Hornsea Three	126	10,774	operation and maintenance screened out as constructing at same time as Rampion 2		Up to 8 vessels in 5 km^2 area at any one time.
Hornsea Four	176	4054			Turbine Foundation - 12 months Turbine - 24 months Substation foundation - 12 months Substation - 12 months IAC & OIC - 24 months OEC - 24 months
Norfolk Vanguard	NS	1,180			Construction may occur in single phase or in two phases with 2 x 590 round trips.

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Moray West	25	NS	NS	150 - 200	Up to 25 vessels offshore during construction. Number of vessels during construction and operation and maintenance and round trips during construction not available.
Norfolk Boreas	NS	1,296	NS	445 (support vessels only)	Max 57 vessels offshore during construction. Approx 36 vessels per month during the 36 month construction period for single phase development or approximately 33 vessels per month during 39 month construction period for two phase development. Number of vessels during construction and operation and maintenance not available.
East Anglia One North	NS	3,335	NS	687 (support vessels only)	Max 74 vessels offshore during construction (including max 3 IAC vessel and 5 EC vessels). Number of vessels during construction and operation and maintenance not available.
East Anglia Two	NS	3,672	NS	687 (support vessels only)	Max 74 vessels offshore during construction (including max 3 IAC vessel and 5 EC vessels). Number of

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
					vessels during construction and operation and maintenance not available.
North Falls	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Sheringham Shoal and Dudgeon Extension	Up to 25 (if Sheringham and Dudgeon constructed concurrently)	1,196	Up to 9 (if Sheringham and Dudgeon constructed concurrently)	694 (although majority (624) will be (small O&M vessel)	May be constructed separately, if so 16 construction vessels each for Sheringham and for Dudgeon and 7 vessels each for Sheringham and for Dudgeon
Fécamp	NS	NS	NS	NS	No information in public domain
Dieppe le Treport	NS	NS	NS	NS	No information in public domain
Five Estuaries	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Outer Dowsing	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Awel y Môr	99	3,961	22	1232	Indicative peak vessels on site simultaneously are 35 during construction
Perpetuus	NS	1,350	NS	NS	900 return trips during construction in 12 months and construction period total is 18 months
Berwick Bank	118	10,964	12	875	Maximum offshore construction periods 96 months
Mona	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Morgan	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Morecambe	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Isle of Man	NS	NS	NS	NS	No published Scoping report
Dublin	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Codling	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Arklow	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
NISA	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Erebus	6	NS	12	NS	Maximum of 6 vessels on site at one time during construction, During operation it will be a minimum of 2 vessels on site per turbine per year and a maximum of 12 vessels per turbine per year
Oriel	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report
Twinhub	NS	NS	NS	NS	Number of vessels and number of round trips not available in Scoping report

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Kinsale	NS	NS	NS	NS	Number of vessels and number of round trips not available
Inis Ealga	NS	NS	NS	NS	Number of vessels and number of round trips not available
Celtic Sea Array	NS	NS	NS	NS	Number of vessels and number of round trips not available
North Celtic Sea	NS	NS	NS	NS	Number of vessels and number of round trips not available
Blackwater	NS	NS	NS	NS	Number of vessels and number of round trips not available
Llyr	NS	NS	NS	NS	Number of vessels and number of round trips not available
Llywelyn	NS	NS	NS	NS	Number of vessels and number of round trips not available
Gwynt Glas	NS	NS	NS	NS	Number of vessels and number of round trips not available
Petroc	NS	NS	NS	NS	Number of vessels and number of round trips not available

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Shelmalere	NS	NS	NS	NS	Number of vessels and number of round trips not available
South Irish Sea	NS	NS	NS	NS	Number of vessels and number of round trips not available
Wicklow	NS	NS	NS	NS	Number of vessels and number of round trips not available
Greystones	NS	NS	NS	NS	Number of vessels and number of round trips not available
Braymore	NS	NS	NS	NS	Number of vessels and number of round trips not available
North Channel	NS	NS	NS	NS	Number of vessels and number of round trips not available
Shearwater 1	NS	NS	NS	NS	Number of vessels and number of round trips not available
Machair wind	NS	NS	NS	NS	Number of vessels and number of round trips not available
Bombora	NS	NS	NS	NS	Number of vessels and number of round trips not available

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Borkum rifgrund	NS	NS	NS	NS	Number of vessels and number of round trips not available
Gode Wind	NS	NS	NS	NS	Number of vessels and number of round trips not available
EnBw	NS	NS	NS	NS	Number of vessels and number of round trips not available
Kaskasi	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hesselo	NS	NS	NS	NS	Number of vessels and number of round trips not available
Thor	NS	NS	NS	NS	Number of vessels and number of round trips not available
Frederikshavn	NS	NS	NS	NS	Number of vessels and number of round trips not available
Vesterhav	NS	NS	NS	NS	Number of vessels and number of round trips not available
Calvados	NS	NS	NS	NS	Number of vessels and number of round trips not available

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Saint Breuic	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hollandse Kust Zuid 1 and 2	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hollandse Kust Zuid 3 and 4	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hollandse Kust Noord	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hollandse Kust Site 5	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hywind Tampen	NS	NS	NS	NS	Number of vessels and number of round trips not available
Seatwirl S2	NS	NS	NS	NS	Number of vessels and number of round trips not available
Seagreen	NS	NS	NS	NS	Number of vessels and number of round trips not available
Dolphyn	NS	NS	NS	NS	Number of vessels and number of round trips not available

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
Beech	NS	NS	NS	NS	Number of vessels and number of round trips not available
Aspen	NS	NS	NS	NS	Number of vessels and number of round trips not available
Forth Wind	NS	NS	NS	NS	Number of vessels and number of round trips not available
Hollyhead Deep	NS	NS	NS	NS	Number of vessels and number of round trips not available
Fair head	NS	NS	NS	NS	Number of vessels and number of round trips not available
Clarus	NS	NS	NS	NS	Number of vessels and number of round trips not available
Caledonia	NS	NS	NS	NS	Number of vessels and number of round trips not available
West of Orkney	NS	NS	NS	NS	Number of vessels and number of round trips not available
Greenlink IC	NS	NS	NS	NS	Number of vessels and number of round trips not available

Project	Construction Vessels		Operation and Maintenance Vessels		Notes
	# vessels	# round trips	# vessels	# round trips/year	
AQUIND IC	NS	NS	NS	NS	Number of vessels and round trips during construction and operation no available
Viking IC	NS	NS	NS	NS	Number of vessels and round trips during construction and operation no available
Endurance Carbon Capture Storage	Unknown				Unknown
Johnson WHPS	Decommissioning: Unknown				Unknown
Johnson template/ manifold	Decommissioning: Unknown				Unknown
Rampion 2	44	1,335	21	1,142	Details in **Table 11-13**

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11.13 Transboundary effects

11.13.1 Transboundary effects arise when impacts from a development within one European Economic Area (EEA) states affects the environment of another EEA state(s). A screening of transboundary effects has been carried out and is presented in Appendix B of the Scoping Report (RED, 2020).

11.13.2 The transboundary screening report identified that due to the nature of the primary direct impact to marine mammals (noise generated from piling during construction), the proposed development could affect EEA states with marine mammals as Qualifying Features at European Sites.

11.13.3 Full consideration of connectivity of European Sites (SACs) is provided through the HRA process, which covers matters associated with European designations in detail and which will also be consulted upon with SNCBs as part of the Application process. As presented in the **Report to Inform Appropriate Assessment** (Document Reference 5.9), it has been concluded that there will be no adverse effect on the integrity of any European designated site from the construction of the Proposed Development. As such, it can be concluded that there will be no significant transboundary effects from the Proposed Development.

11.14 Inter-related effects

11.14.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors, identified in **Section 11.6**.

11.14.2 Inter-related effects could potentially arise in one of two ways. The first type of inter-related effect is a Proposed Development lifetime effect, where multiple phases of the Proposed Development interact to create a potentially more significant effect on a receptor than in one phase alone. The phases for Rampion 2 are construction, operation and maintenance, and decommissioning. All Proposed Development lifetime effects are assessed in **Chapter 30: Inter-related effects, Volume 2** (Document Reference: 6.2.30).

11.14.3 The second type of inter-related 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.

11.14.4 Receptor-led effects have been considered, where relevant, in this chapter for potential interactions between marine mammals and the following environmental aspects:

- Inter-related effect from combination of disturbance from underwater noise, the presence of vessels and loss of prey resources;
- Inter-related effects from the interaction of increased SSC and smothering, and underwater noise; and

- Inter-related effects from the interaction of increased SSC and smothering, and habitat loss/disturbance.

11.14.5 Full results of the receptor-led effects assessment can be found in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30).

11.15 Summary of residual effects

11.15.1 **Table 11-47** presents a summary of the assessment of significant impacts, any relevant embedded environmental measures and residual effects on marine mammal receptors.

Table 11-47 Summary of assessment of residual effects

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures	Assessment of residual effect (significance)
Construction				
Construction noise impacts (PTS) (piling and UXO clearance)	Piling: Negligible	Piling: Low (all species)	C-52, C-54, C-102	**Negligible (no significant ecological effect) (piling)**
	UXO clearance: Low	UXO clearance: Low		**Minor adverse (no significant ecological effect) (UXO)**
Construction noise impacts (Disturbance)	Piling: Low (cetaceans) Very low (pinnipeds) UXO clearance: Low	Piling: Low (cetacean species and harbour seal) and very low (grey seal) UXO clearance: Low	C-52, C-102	**Minor adverse (no significant ecological effect)**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures	Assessment of residual effect (significance)
Non-piling noise – Underwater noise from seabed preparation, rock dumping and cable installation	Very low	Low (cetacean species and harbour seal) and very low (grey seal)	C-52	**Negligible (no significant ecological effect)**
Vessel collision risk	Very low	High	C-51	**Minor adverse (no significant ecological effect)**
Vessel disturbance	Low	Low	C-51	**Minor adverse (no significant ecological effect)**
Change to prey availability	Very low	Low	C-52	**Negligible (no significant ecological effect)**
Disturbance to seal haul out sites at landfall	Very low	Medium	C-52, C-102	**Minor significance (no significant ecological effect)**
Operation and maintenance				
Operational noise	Very low	Very low	N/A	**Negligible (no significant ecological effect)**
Vessel collision risk	Very low	High	C-51	**Minor adverse (no significant ecological effect)**
Vessel disturbance	Low	Very low	C-51	**Negligible (no significant**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures	Assessment of residual effect (significance)
				ecological effect)
Changes to prey availability	Very low	Low	C-52	**Negligible (no significant ecological effect)**
Decommissioning				
Decommissioning noise impacts (PTS)	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from decommissioning noise (PTS) impacts on marine mammals has been assessed as being of **minor adverse significance**, which is **Not Significant** in EIA terms.			
Decommissioning noise impacts (disturbance)	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from decommissioning noise (disturbance) impacts on marine mammals has been assessed as being of **minor adverse significance**, which is **Not Significant** in EIA terms.			
Vessel collision risk	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from vessel collision risk has been assessed as being of **minor adverse significance**, which is **Not Significant** in EIA terms			
Vessel disturbance	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from vessel disturbance on marine mammals has been assessed as being of **negligible significance**, which is **Not Significant** in EIA terms			
Changes in prey availability	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from changes in prey availability on marine mammals has been assessed as being of **negligible significance**, which is **Not Significant** in EIA terms			
Disturbance of seal haul out sites at landfall	The potential impacts during the decommissioning phase are anticipated to be similar or less than during construction. Therefore, the significance of effect from disturbance to seal haul out sites has been assessed as being of **negligible significance**, which is **Not Significant** in EIA terms.			

11.16 Glossary of terms and abbreviations

Table 11-48 Glossary of terms and abbreviations – marine mammals

Term (acronym)	Definition
ADD	Acoustic Deterrent Devices
BAP	Biodiversity Action Plan
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of a development.
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of the Proposed Development together with any known or foreseeable future changes that will take place before the completion of the Proposed Development.
BEIS	Department for Business, Energy, and Industrial Strategy
CEA	Cumulative Effects Assessment
Construction effects	Used to describe both temporary effects that arise during the construction phases as well as permanent existence effects that arise from the physical existence of development (for example new buildings).
CTV	Crew Transfer Vessel
Cumulative effects	Additional changes caused by a Proposed Development in conjunction with other similar developments or as a combined effect of a set of developments.
Cumulative Effects Assessment (CEA)	Assessment of impacts as a result of the incremental changes caused by other past, present and reasonably foreseeable human activities and natural processes together with the Proposed Development.
DCO Application	An application for consent to undertake a Nationally Significant Infrastructure Project made to the Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether development consent should be granted for the Proposed Development.
Decommissioning	The activity during which a development and its associated processes are removed from active operation.
DEPONS	The Disturbance Effects of noise on the harbour Porpoise population in the North Sea

Term (acronym)	Definition
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
DML	Deemed Marine Licence
ECC	Export Cable Corridor
EDR	Effective Deterrent Range
Embedded environmental measures	Equate to 'primary environmental measures' as defined by Institute of Environmental Management and Assessment (2016). They are measures to avoid or reduce environmental effects that are directly incorporated into the preferred masterplan for the Proposed Development.
EMF	Electro-Magnetic Frequency
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 Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
EPS	European Protected Species
ETG	Expert Topic Group
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach and the information required to support the EIA and HRA for certain aspects.
Future baseline	Refers to the situation in future years without the Proposed Development.
HDD	Horizontal Directional Drilling
HRA	Habitat Regulations Assessment
Impact	The changes resulting from an action.
Indirect effects	Effects that result indirectly from the Proposed Development as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects. Often used to describe effects on landscape character that are not directly impacted by the Proposed Development such as

Term (acronym)	Definition
	effects on perceptual characteristics and qualities of the landscape.
JUV	Jack-Up Vessel
Likely Significant Effects	It is a requirement of Environmental Impact Assessment Regulations to determine the likely significant effects of the Proposed Development on the environment which should relate to the level of an effect and the type of effect.
LSE	Likely Significant Effect
Magnitude (of change)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short term or long term in duration'. Also known as the 'degree' or 'nature' of change.
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLS	Most Likely Scenario
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MP	Monopile
MPCP	Marine Pollution Contingency Plan
MSFD	Marine Strategy Framework Directive
MU	Management Unit
MWWC	Marine Wildlife Watching Code
Nationally Significant Infrastructure Project (NSIP)	Nationally Significant Infrastructure Projects are major infrastructure developments in England and Wales which are consented by DCO. These include proposals for renewable energy projects with an installed capacity greater than 100MW.
NPS	National Policy Statement
PDV	Phocine Distemper Virus
PEMMP	Project Environmental Monitoring and Management Plan
PINS	Planning Inspectorate

Term (acronym)	Definition
Planning Inspectorate	The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
PP	Pinpile
Preliminary Environmental Information Report (PEIR)	The written output of the Environmental Impact Assessment undertaken to date for the Proposed Development. It was developed to support the statutory Section 42 consultation in July to September 2021. The PEIR presented the preliminary findings of the assessment to allow an informed view to be developed of the Proposed Development, the assessment approach that had been undertaken, the preliminary conclusions on the likely significant effects of the Proposed Development and environmental measures proposed.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).
Proposed Development Consent Order (DCO) Limits	The area within which the Proposed Development and associated infrastructure will be located, including the temporary construction, and operation and maintenance work areas
PTS	Permanent Threshold Shift
Rampion 2	Rampion 2 Offshore Wind Farm
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to pollutants which could potentially arise as a result of the Proposed Development.
RIAA	Report to Inform Appropriate Assessment
SAC	Special Area of Conservation
Scoping Opinion	A Scoping Opinion is adopted by the Secretary of State for a Proposed Development.
Scoping Report	A report that presents the findings of an initial stage in the Environmental Impact Assessment process.
Secretary of State	The body who makes the decision to grant development consent.

Term (acronym)	Definition
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 effects	It is a requirement of the EIA Regulations 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.
SNCB	Statutory Nature Conservation Bodies
SOV	Service Operation Vessels
SPA	Special Protection Area
Temporal Scope	The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur and are typically defined as either being temporary or permanent.
Temporary or permanent effects	Effects may be considered as temporary or permanent. In the case of wind energy development the application is for a 30 year period after which the assessment assumes that decommissioning will occur and that the site will be restored. For these reasons the development is referred to as long term and reversible.
The Applicant	Rampion Extension Development Limited (RED)
TTS	Temporary Threshold Shift
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
Zone of Influence (ZOI)	The area surrounding the Proposed Development which could result in likely significant effects.

11.17 References

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Rampion 2
WIND FARM