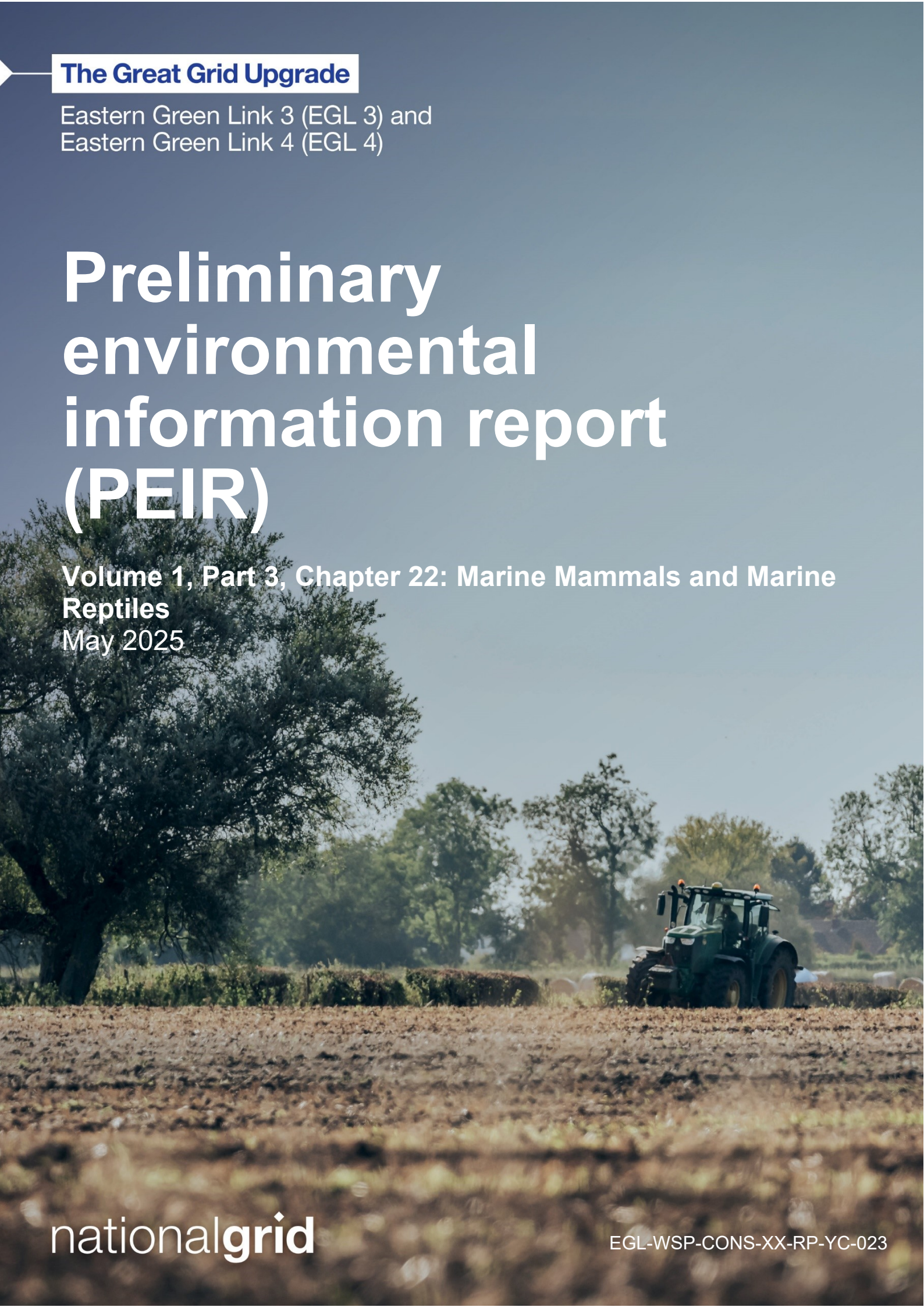
The Great Grid Upgrade

Eastern Green Link 3 (EGL 3) and
Eastern Green Link 4 (EGL 4)

Preliminary environmental information report (PEIR)

Volume 1, Part 3, Chapter 22: Marine Mammals and Marine Reptiles

May 2025



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22. Marine Mammals and Marine Reptiles

22.1 Introduction

22.1.1 This chapter presents the preliminary findings of the Environmental Impact Assessment (EIA) undertaken to date for the Eastern Green Link 3 (EGL 3) and Eastern Green Link 4 (EGL 4) English Offshore Scheme, with respect to marine mammals. The preliminary assessment is based on information obtained to date. It should be read in conjunction with the description of the Projects provided in **Volume 1, Part 1, Chapter 4: Description of the Projects**.

22.1.2 The review of the baseline environment for the Scoping Report concluded that marine turtles are rarely present in the Southern North Sea (Scoping Report Table 27-4). The proposed scope of the assessment (Scoping Report Table 27-6) did not include marine turtles as a receptor. Whilst the Natural England response to the Scoping Report made a general comment that the Environmental Statement (ES) should assess the impacts on Protected Species (including marine turtles in the examples given) the Scoping Opinion (Ref EN0210003) did not comment on the proposed scope with respect to marine turtles. This chapter therefore continues to scope marine turtles out of the assessment on the basis that they are rarely present, but if present, environmental measures proposed for cetaceans and pinnipeds would adequately mitigate any impacts. Marine turtles have therefore not been assessed in this Preliminary Environmental Information Report (PEIR) chapter.

22.1.3 This chapter describes the methodology used, the datasets that have informed the preliminary assessment, baseline conditions, environmental measures, and the potential preliminary marine mammals effects that could result from the English Offshore Scheme during the construction and operation (and maintenance) phases. Specifically, it relates to the English Offshore elements of EGL 3 and EGL 4 (the English Offshore Scheme) seaward of Mean High Water Springs (MHWS).

22.1.4 This chapter should be read in conjunction with:

- **Volume 1, Part 2, Chapter 6: Biodiversity** (which considers the European otter (*Lutra lutra*), a mammal that can use the intertidal and nearshore environment for foraging);
- **Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes** (which identifies the spatial extent of potential for impacts from temporary sediment suspension and subsequent redeposition);
- **Volume 1, Part 3, Chapter 19: Intertidal and Subtidal Benthic Ecology** (which identifies the potential impacts on supporting habitats and key prey species for marine mammals); and
- **Volume 1, Part 3, Chapter 20: Fish and Shellfish** (which identifies the potential impacts on key prey species for marine mammals).

22.1.5 This chapter is supported by the following figures:

- **Volume 3, Part 3, Figure 22-1: Marine Mammal Study Area;**

- **Volume 3, Part 3, Figure 22-2: Designated Areas within Marine Mammal Qualifying Features;**
- **Volume 3, Part 3, Figure 22-3: SCANS III and SCANS IV Survey Blocks;**
- **Volume 3, Part 3, Figure 22-4: Harbour Porpoise Density within the Southern North Sea SAC; and**
- **Volume 3 Part 3, Figure 22-5: Seal Density Distribution**

22.1.6 This chapter is supported by the following appendices:

- **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment**
- **Volume 2, Part 3, Appendix 3.17.A: Habitats and Regulations Assessment Screening Report**
- **Volume 2, Part 3, Appendix 3.17.B: Marine Conservation Zone (MCZ) Screening Report**
- **Volume 2, Part 3, Appendix 3.17C: Marine Conservation Zone (MCZ) Stage 1 Assessment**
- **Volume 2, Part 1, Appendix 1.5.C: Outline Construction Environmental Management Plan**
- **Volume 2, Part 1, Appendix 1.2.A: Regulatory and Planning Context**
- **Volume 2, Part 1, Appendix 1.5.A: Outline Register of Design Measures**

22.1.7 As set out in **Volume 1, Part 1, Chapter 1: Introduction**, cable installation and some associated activities beyond 12 nautical miles (NM) are exempt under the Marine and Coastal Access Act (MCAA) as well as repair of the installed cable. This chapter presents a preliminary assessment of the cable route from MHWS at the Anderby Creek Landfall to the border with Scottish adjacent waters. This is to provide a holistic view of the English Offshore Scheme and any associated impacts, however, consent is not being sought for the exempt cable (either installation or repair) and only cable protection and dredging for sandwave levelling will be included in the deemed Marine Licence (dML) beyond 12 NM.

Limitations

22.1.8 The information provided in this PEIR is preliminary, the final assessment of potential significant effects will be reported in the ES. The PEIR has been produced to fulfil National Grid Energy Transmission plc (NGET)'s consultation duties in accordance with Section 42 of the PA2008 and enable consultees to develop an informed view of the preliminary potential significant effects of the / English Offshore Scheme.

22.1.9 This PEIR has been collated based on publicly available data and information only. It is assumed that the data collected is accurate. However, there are limitations to the original marine mammal surveys used to form this data. Namely that most marine mammals are wide ranging and uninhibited by anthropogenic borders. Those recorded within the study area are likely to be individuals from larger biological populations originating from other points along the UK coast, internationally or the High Seas. Therefore, each survey provides a synopsis of wider marine mammal populations in the North Sea and beyond. Data from the Small Cetacean Abundance in the North Sea and Adjacent Waters surveys (SCANS) used in this assessment is collected during the summer months (mainly July) of a given survey year, representing summer distributions

of cetacean species only. Summer distributions are generally higher than winter, meaning the assessment is based upon a worst-case scenario of cetacean presence in the study area.

22.1.10 The data has not been supplemented by additional project specific marine mammal field surveys as the publicly available information collated as part of the desktop review was considered sufficient for the nature of the English Offshore Scheme. However, where marine mammal observations have been undertaken e.g., as mitigation for the English Offshore Scheme marine characterisation surveys, the observations have been used to supplement the publicly available data.

22.1.11 The assessment has been undertaken based on the description of the English Offshore Scheme presented in **Volume 1, Part 1, Chapter 4: Description of the Projects**. To allow flexibility due to changing seabed conditions or features, it is assumed that the English Offshore Scheme could be installed anywhere within the draft Order Limits. Whilst indicative locations have been provided for external cable protection, it is also assumed that remedial external cable protection could be used at any point along the Projects and therefore anywhere within the draft Order Limits.

22.1.12 In the absence of publicly available data, a precautionary approach has been taken based on experience of similar linear schemes and professional judgement, to inform the scope of the assessment.

22.1.13 It is assumed that the data available for existing literature, relevant surveys and the proposed assessments will provide an appropriate evidence base for marine mammals within the study area. It is recognised that there is limited data available on the behaviour and extent of some species, however, given the linear nature of the Projects and the temporary nature of most potential impacts, it is not anticipated this limitation will adversely affect the assessment.

Preliminary significance conclusions

22.1.14 For ease of reference, a summary of the significant and potential significant effects from the preliminary marine mammal assessment is provided in **Table 22-1.** All other effects in relation to have been assessed as not significant. Further details of the methodology behind the assessment, and a detailed narrative of the assessment itself are provided within the sections below. The assessments are presented in full in **Section 22.10.**

Table 22-1 – Preliminary summary of significance of effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Underwater noise changes – Geophysical survey (Sub-bottom profiler) Cetaceans Pinnipeds	High	Low	Moderate	Noise levels are sufficient to cause injury to marine mammals. Industry standard mitigation has been proposed in the Preliminary Environmental Assessment. **With the implementation of industry standard measures No Potential Significant Effects are predicted.**
Activities not included in the Deemed Marine Licence – preliminary assessment provided for information only				
Underwater noise changes – UXO clearance (low order) Cetaceans Pinnipeds	High	High	Major	Noise levels are sufficient to cause injury to marine mammals. Mitigation has been proposed in the Preliminary Environmental Assessment. **With the implementation of mitigation No Potential Significant Effects are predicted.**
Underwater noise changes – unexploded ordnance (UXO) clearance (high order) Cetaceans Pinnipeds	High	High	Major	Noise levels are sufficient to cause injury to marine mammals. Mitigation has been proposed in the Preliminary Environmental Assessment. **With the implementation of mitigation Potential Significant Effects are predicted.**

1. The sensitivity/importance/value of a receptor is defined using the criteria set out in Section 22.10 and is defined as negligible, low, medium, high
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in Section 22.9 and is defined as negligible, low, medium and high
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (potentially significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in Section 22.9.

22.2 Relevant technical guidance

22.2.1 The legislation and planning policy which has informed the assessment of effects with respect to marine mammals is provided within **Volume 2, Part 1, Appendix 1.2.A: Regulatory and Planning Context**. Further information on policies relevant to the English Offshore Scheme marine mammals is provided in **Volume 1, Part 1, Chapter 2: Regulatory and Policy Overview.** A preliminary marine plan assessment is provided as **Volume 2, Part 1, Appendix 1.2.B: Marine Plan Assessment.** Relevant technical guidance, specific to marine mammals, that has informed this PEIR and will inform the assessment within the ES is summarised below.

Technical guidance

22.2.2 A summary of the technical guidance for marine mammals is given in **Table 22-2.**

Table 22-2 – Technical guidance relevant to the marine mammal assessment

Technical guidance document	Context
2024 Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0) (NFMS, 2024, REF 22.1).	These publications set out the peer reviewed thresholds for assessing the significance of underwater noise changes on marine mammals in terms of injury and disturbance effects.
2021 Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioural Responses to Human Noise (Southall et al, 2021, REF 22.2).	
2019 Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall et al, 2019, REF 22.3).	
2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts (NOAA, 2018, REF 22.4).	
2020 Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (Joint Nature Conservation Committee (JNCC), 2020, REF 22.5)	Sets out the industry standard approach to assessing the potential effects of a project on harbour porpoise. Establishes Effective Deterrence Ranges (EDR) for geophysical survey and other impulsive sound sources used in offshore construction.
2017 JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017, REF 22.6)	Sets out industry standard approach to mitigation for geophysical surveys

Technical guidance document	Context
2025 JNCC guidelines for minimising the risk of injury to marine mammals from UXO clearance in the marine environment (JNCC, 2025 REF 22.7)	Sets out the industry approach to mitigation for UXO clearance
2025 UK Government Guidance Supporting minimising environmental impacts from unexploded ordnance clearance (Gov.uk, 2025, REF 22.8).	

22.3 Consultation and engagement

Overview

22.3.1 The assessment has been informed by consultation responses and ongoing stakeholder engagement. An overview of the approach to consultation is provided in **Section 5.9** of **Chapter 5: PEIR Approach and Methodology**.

Scoping Opinion

22.3.2 A Scoping Opinion was adopted by the Secretary of State, administered by the Planning Inspectorate, on 05 September 2024. A summary of the relevant responses received in the Scoping Opinion in relation to marine mammals and confirmation of how these have been addressed within the assessment to date is presented in **Table 22-3.**

22.3.3 **Volume 2, Part 1, Appendix 1.1.A: Scoping Opinion Responses** outlines the comments made in the Scoping Opinion in relation to marine mammals and how these have been addressed within this PEIR.

Table 22-3 – Summary of EIA Scoping Opinion responses for marine mammals

Consultee	Consideration	Comments	How addressed in this PEIR
Planning Inspectorate	5.5.1 Collision of Project vessels and Project equipment with Cetaceans and Pinnipeds - all phases	The Planning inspectorate does not agree to scope this matter out at this stage	Collision of Project vessels is included in the Preliminary Assessment **Section 22.16.**
Planning Inspectorate	5.5.2. Electromagnetic changes/barrier to species movement from the presence of cables on cetaceans and pinnipeds - operation	Agrees this matter should be scoped out. The Planning Inspectorate acknowledges that this is an evolving matter so agreement should be sought from the relevant conservation bodies.	Acknowledged. Impact pathway continues to remain scoped out as agreed with JNCC (March 2025).

Consultee	Consideration	Comments	How addressed in this PEIR
Planning Inspectorate	5.5.3. Temperature Increase from presence of cables on Cetaceans and Pinnipeds - operation	The Proposed Development commits to burying the cables at 1.0-2.5m which is deeper than 0.75 where an increase of 2 degree Celsius could occur. Content to scope this matter out.	Acknowledged. Impact pathway continues to remain scoped out.
Planning Inspectorate	5.5.4. Accidentals spills (Hydrocarbon and Polycyclic Aromatic Hydrocarbons (PAH) contamination) from Project vessels and equipment on Cetacean and Pinniped- all phases	The Planning Inspectorate is content to scope this matter out noting the legal requirements upon vessels to manage any accidental releases or spills of materials or chemicals. The ES should include details of the mitigation and explain how its delivery is assured with reference to relevant documents	Impact pathway continues to remain scoped out. Please refer to **Table 22-19** for detail on environmental measures to be implemented to control accidental spills.
Planning Inspectorate	5.5.5 Consistency	The scoping out table has taken the approach to use N/A in cells without any discussion as to why commentary has not been provided. assumption has been made to scope the matter out at that stage. The Planning Inspector has made no further comments, therefore the ES should provide sufficient justification for the approach taken.	N/A (Not Appropriate) was used in the Scoping Report, for phases when no impact pathway was identified. For example, during construction when Electromagnetic Field (EMF) is not generated as the cables are not operational.
Planning Inspectorate	5.5.6.Reptiles	The Scoping table makes no reference to reptiles and the assessment to be undertaken despite the title of the aspect chapter being Marine Mammals and Marine Reptiles.	Paragraph **22.1.2** above provides justification for why marine reptiles are not included within the preliminary assessment.
Planning Inspectorate	5.5.7.Unexploded Ordnance (UXO)	The Scoping Report does not make clear reference to unexploded ordnance. This should be considered as part of the assessment; it is not clear in the Scoping Report where this has been taken into account. This matter should be assessed in	**Volume 1, Part 1, Chapter 4: Description of the Projects** establishes that the Applicant is applying to undertake UXO identification as part of the Deemed Marine

Consultee	Consideration	Comments	How addressed in this PEIR
		relation to noise impacts on marine mammals, for example, at a justified charge rate where there is the potential for significant effects. Agreement to the approach should be sought from relevant consultation bodies.	Licence. UXO Clearance would be the subject of a separate Marine Licence and Environmental Impact Assessment.
Planning Inspectorate	5.5.8.Marine Mammal Management Units	Figure 27-1 does not appear to be labelled correctly. Furthermore, the study area does not appear to be shown on this figure, nor are distances discussed in the Scoping Report **Table 27-1** in relation to the study area. The Planning Inspectorate would expect the study area for cetaceans to be sufficient to identify all the relevant designated sites with cetacean qualifying features, given that harbour porpoise and bottlenose dolphin are highly mobile.	The figure has been replicated in this PEIR chapter and updated. Please refer to **Volume 3, Part 3, Figure 23-1 Average Vessel Hours (2023 – 2024) - All Vessels** and **Figure 23-2 Royal Yachting Association UK, Coastal Atlas of Recreational Boating**.
Planning Inspectorate	5.5.9 and 5.5.10 Study areas	**Table 27-1** does not provide a justification for the 100 km distance from haul out sites to inform the study area for Grey Seal or Sea Turtles. For each species listed in **Table 27-1,** the ES should set out its range/activities which have been used to inform the study area. A figure should be provided to depict the study area. Where possible agreement should be sought with relevant consultation bodies.	The 100 km distance has been justified in **Table 22-5**. The study area for this chapter is illustrated in **Volume 3, Part 3, Figure 22-1: Marine Mammal Study Area.**
Planning Inspectorate	5.5.11. Geophysical Surveys	It is noted that the Scoping Report references the need to undertake geophysical surveys but that the effect of these would not be assessed. The Planning Inspectorate advises that where activities have the potential to give rise to significant effects, these should be assessed.	The potential impacts of geophysical surveys on marine mammals have been considered by the EIA and assessed in the Preliminary Assessment – see **Section 22.13**.

Technical engagement

22.3.4 Technical engagement with consultees in relation to marine mammals is ongoing. A summary of the technical engagement undertaken to March 2025 is outlined in **Table 22-4.**

Table 22-4 – Technical engagement on the environmental aspect assessment

Consultee	Consideration	How addressed in this PEIR
JNCC	JNCC and NE Feedback on Updated Routes 31/05/2024 If sub-bottom profile surveys are over 42 days, they should have an European Protected Species (EPS) licence	The Preliminary Assessment will help identify any activities which will require an EPS licence in conditions which cause harm and disturbance to EPS.
JNCC	JNCC Project Update Meeting on the 23/10/2024 With regards to UXO clearance it is the JNCCs preference that this be covered as a separate Marine Licence (and not under the Deemed Marine Licence). It is also their preference that low order is attempted first before high order detonation. A Marine Mammal Mitigation Plan would be needed for any clearance works.	**Volume 1, Part 1, Chapter 4: Description of the Projects** establishes that the Applicant is applying to undertake UXO identification as part of the Deemed Marine Licence. UXO Clearance would be the subject of a separate Marine Licence and Environmental Impact Assessment. A high level preliminary assessment of the effects of UXO clearance and the potential environmental measures that would be discussed with JNCC has been provided in **Section 22.15**
JNCC	Eastern Green Link 3 and 4 JNCC Project Update Meeting 10/02/25 JNCC to confirm if high level noise assessment for UXO clearance is required in the Development Consent Order (DCO). Reiterated preference to cover UXO clearance separately to the DCO. i.e., as a separate Marine Licence.	

22.3.5 Monthly meetings are scheduled with the MMO and JNCC between PEIR and ES. Discussions will cover a wide range of ecological topics but of relevance to marine mammals will include underwater noise effects. Discussions on the same topic will also be held with Cefas and Natural England.

22.4 Data gathering methodology

22.4.1 This PEIR is based on a range of publicly available data and information only. It is assumed that the data collated is accurate. The data has been supplemented with additional information acquired as part of the stakeholder engagement process. The sources of data used are noted in **Table 22-6.**

Study area

22.4.2 The English Offshore Scheme proposes to route from Anderby Creek across the Southern and Central North Sea to the boundary between the English and Scottish

Exclusive Economic Zones (EEZ). The draft Order Limits for the English Offshore Scheme is illustrated in **Volume 3, Part 3, Figure 22-1: Marine Mammal Study Area.**

22.4.3 Given the highly mobile and transient behaviour of marine mammals, the study area for these species has been delineated according to their mobility and geographic range, as detailed in **Table 22-5**.

22.4.4 Separate areas for each cetacean species have been defined using Management Units (MUs). These are delineated by the Inter-Agency Marine Mammal Working Group (which comprises representatives from the UK Statutory Nature Conservation Bodies i.e., Natural England, NatureScot, Natural Resources Wales and the Department of Agriculture, Environment and Rural Affairs). The boundaries of a MU do not necessarily reflect the full range of a species but instead shows areas within their territory where management of human activities is undertaken. These units were defined by considering several factors including the known population structure, movement and habitat use, as well as jurisdictional boundaries and divisions already used in the management of human activities. MUs are used to inform Statutory Nature Conservation Body (SNCB) advice and are therefore the appropriate spatial scale for assessment of environmental impacts on species from marine development projects. MUs are reviewed at least every five years and are defined for the seven most commonly occurring cetacean species in UK waters: harbour porpoise, white-beaked dolphin, bottlenose dolphin, common-short beaked dolphin, minke whale, Atlantic white-sided dolphin and Risso's dolphin. The latest review of MUs was published in March 2023 (IAMMWG 2023 REF 22.9).

Table 22-5 - Study area for marine mammals

Receptor	Extent of Study Area	Justification
Cetaceans (porpoises, dolphins and whales)	Management Units (MUs) 250 km from the draft Order Limits for transboundary European sites	The relevant MUs for the seven commonly occurring species have been used to define the study area, noting that the study area will change per species. **Volume 3, Part 3, Figure 22-1: Marine Mammal Study Area** illustrates the spatial scale of the management units through which the English Offshore Scheme passes. The EIA determined that the maximum zone of influence from potential impacts on cetaceans relates to underwater noise changes. Underwater noise modelling, provided as **Volume 1, Part 3, Chapter 22: Marine Mammals and Marine Reptiles, Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment,** concludes disturbance effects could be experienced up to 2.8 km from the draft Order Limits (a maximum precautionary distance arising from vessel noise) and 5 km for geophysical survey. The spatial scale of the MUs is therefore sufficient to encompass this zone of influence. A buffer of 250 km from the draft Order Limits has been used to identify relevant transboundary European sites. In UK waters

Receptor	Extent of Study Area	Justification
		harbour porpoise are observed to have seasonal grounds which stretch longitudinally for approximately 250 km. Therefore, a study area of 250 km is considered to be an appropriate distance to screen designated sites for mobile marine mammal species. Given that the spatial scale of impacts will be restricted to 2.8 km from the draft Order Limits this is a precautionary and conservative search area.
Grey seal (*Halichoerus gryphus*)	Assessment Units: Southeast England, Northeast England. 100 km radius from Anderby Creek Landfall and coastline	Animals are known to go on foraging trips up 100 km or more (Carter et al., 2022 REF 22.10; SCOS, 2022 REF 22.11), but this is outside of the breeding season, so doesn't impact the conservation objectives for grey seals. Based on telemetry data NatureScot (NatureScot 2023 REF 22.12) advises that the screening buffer used for grey seals is 20 km, this is only representative of the breeding season. As a precaution, both values have been considered by the assessment, but the Management unit has been used to identify relevant designated sites.
Harbour seal (*Phoca vitulina*)	50 km radius from Anderby Creek Landfall and coastline	Harbour seals are not known to make trips greater than 50 km from haul out sites, JNCC advises that a 50 km buffer is used for assessment purposes (JNCC, 2017 REF 22.13; OAP, 2022 REF 22.14).
European otter (*Lutra lutra*)	Up to 80 m from MHWS and seaward. 32 km along the coastline from Anderby Creek Landfall	The European otter is a semi-aquatic mammal which occurs in a wide variety of aquatic habitats such as rivers, streams, lakes, estuaries and on the coast. In freshwater habitats, otters are largely (but not exclusively) nocturnal and occupy very large home ranges (around 32 km for males and 20 km for females). Coastal otters generally have much smaller home ranges than their riverine counterparts, these can be as little as 4-5 km of coastline, because of the abundance of fish and crustacean prey in inshore waters (NatureScot., 2023 REF 22.12). It has been suggested that the otter's range is approximately 80 m seaward from the coast (NPWS., 2015 REF 22.15).

Tidal River Works

22.4.5 In addition to the English Offshore Scheme works are proposed within a tidal river. The works consist of the following:

- Tidal river crossings of the River Nene and the River Welland by Horizontal Directional Drilling or trenchless solution beneath the bed of the rivers
- Option for the construction of a Temporary Quay on the River Nene.

22.4.6 In respect to the Tidal River Crossings and in accordance with Article 35 of the 2011 Exempted Activities Order these activities are considered a 'bored tunnel' and exempt from needing a Marine Licence, as works will be carried wholly under the seabed there will be no interaction and no potential for significant adverse effects on the marine environment. Therefore, these works will not be included in the dMLs. Impacts relating to the drill entry and exit above MHWS are assessed in relevant chapters of the English Onshore Scheme in **Volume 1, Part 2 English Onshore Scheme**.

22.4.7 The River Nene Temporary Quay is an option being explored within the Projects design for delivery of components for the English Onshore Scheme. At this stage feasibility of the temporary quay is still being explored, and insufficient information is available to complete a preliminary assessment. If taken forward, the ES will include a full assessment of effects of the temporary quay. **Section 22.18** outlines the further work that will be undertaken to inform the assessment.

Desk study

22.4.8 A summary of the organisations that have supplied data, together with the nature of that data is outlined in **Table 22-6.**

Table 22-6 – Data sources used to inform the marine mammals assessment

Organisation	Data source	Data provided
NE	Natural England Open Data Geoportal: https://naturalengland-defra.opendata.arcgis.com/	An interactive data geoportal that enables access to spatial information relating to the marine environment in England
JNCC	JNCC Southern North Sea MPA: https://jncc.gov.uk/our-work/southern-north-sea-mpa/	Southern North Sea MPA, Guidance for underwater noise against conservation objectives of harbour porpoise, Berwickshire and North Northumberland Coast, Harbour Porpoise.
Defra - Magic Maps	Magic Map: https://magic.defra.gov.uk/Magic_redirect.htm?aspxerrorpath=/magicmap.aspx	An interactive mapping system developed by Department for Environment, Food and Rural Affairs that holds spatially referenced data on the natural environment for England
DECC (2022)	UK Offshore Energy Strategic Environmental Assessment - Future Leasing/Licensing for Offshore Renewable Energy, Offshore Oil & Gas and Gas Storage and Associated	Summarises the environmental baseline for UK seas, including for marine mammals. Summarises UK Regional Seas. The Southern North Sea SAC falls within Regional Sea 2 (Southern North Sea).

Organisation	Data source	Data provided
	Infrastructure. OESEA4 Environmental Report.	
Reid et al. (2016)	JNCC Atlas of Cetacean Distribution: https://hub.jncc.gov.uk/assets/a5a51895-50a1-4cd8-8f9d-8e2512345adf	Species Distribution Maps.
Hammond et al. (2021)	Estimates of Cetacean Abundance: https://oceanmodelingforum.org/wp-content/uploads/2021/12/Hammond-et-al.-2021.pdf	Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys
Gilles et al. (2023)	SCANS IV Report: https://dce.au.dk/fileadmin/dce.au.dk/Udgivelser/Eksterne_udgivelser/20230928_SCANS-IV_Report_FINAL.pdf	Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys
ICES (2022)	ICES Data: https://cetaceans.ices.dk/dashboard	Portal collating at-sea effort-related data collected via ship-based or aerial methods, under the JCDP.
Heinanen and Skov (2015)	JNCC Harbour Porpoise: https://hub.jncc.gov.uk/assets/f7450390-9a89-4986-8389-9bff5ea1978a	The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area
Marine Scot Carter et al. (2022)	Seal Usage maps: https://marine.gov.scot/maps/2029	Updated seal usage maps: The estimated at-sea distribution of grey and harbour seals
Sea Watch Foundation	Seawatch Foundation sightings: https://www.seawatchfoundation.org.uk/recentsightings/	Sea Watch Foundation sightings data from 2023-2024
The Marine Life Information Network (2023)	Marine Life Network: https://www.marlin.ac.uk/species	Species Information
NBN Atlas	NBN Atlas: https://nbnatlas.org/?gclid=EAIaIQobChMI9_-9je-siwMVmpJoCR1dMzcHEAAYASAAEgJMT_D_BwE	Occurrence records for cetaceans, pinnipeds and Eurasian otter.
British Ecological Society Waggitt et al. (2020)	Cetacean populations: https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13525	Distribution maps of cetacean and seabird populations in the Northeast Atlantic

Organisation	Data source	Data provided
MarineScotland Hague et al. (2020)	Marine mammal abundance: https://data.marine.gov.scot/dataset/regional-baselines-marine-mammal-knowledge-across-north-sea-and-atlantic-areas-scottish	Provides a review of abundance estimates and distribution of marine mammals across the North Sea and Atlantic areas of Scottish waters
Special Committee on Seals (SCOS, 2022)	Seal populations: https://www.smru.st-andrews.ac.uk/files/2023/09/SCOS-2022.pdf	UK seals monitoring programme – annual report 2022 (or subsequent update if released)
The Environment Agency Crawford (2010)	Otter Survey: https://ptes.org/wp-content/uploads/2015/06/National-Otter-Survey.pdf	Fifth otter survey of England 2009 – 2010, Sixth otter survey of England was conducted in 2022-2023 but results have not been published
JNCC IAMMWG (2023)	Marine Mammal management units: https://hub.jncc.gov.uk/assets/b48b8332-349f-4358-b080-b4506384f4f7	Updated abundance estimates for cetacean Management Units in UK waters. JNCC Report No. 734.
Offshore Wind Farm Aerial Surveys	Dogger Bank A+B: https://doggerbank.com/wp-content/uploads/2021/11/ES-Chapter-14-Appendix-A-Seal-Telemetry-Report.pdf Hornsea 3: https://orstedcdn.azureedge.net/-/media/www/docs/corp/uk/hornsea-project-three/how03_peir_volume-2-chapter-4_marine-mammals.pdf?rev=ef3e04da570e4314a8ba38de2d7445ff&hash=4277DA1DB1E6A13EA9348027E1CA59BC Hornsea 4 ES: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-000706-A2.4%20ES%20Volume%20A2%20Chapter%204%20Marine%20Mammals.pdf Hornsea 4 Scoping: https://infrastructure.planningins	Offshore Wind Farms (OWF) collect two years of aerial survey data to establish the baseline for marine mammals within the array sites. The following OWFs lie within the study area and data has been sought from the projects consent applications to inform the baseline: • Hornsea Project Three: PIER • Hornsea Project Four: Environmental Statement (ES) Volume 42, Chapter 42: Marine Mammals • Dogger Bank ES Appendix A • Hornsea Project Two: EIA Scoping Report: Harbour and grey seal surveys • Ossian Chapter 10: Marine Mammals Array EIA Report 2024 • Outer Dowsing Offshore Wind PEIR Volume 1, chapter 11: Marine Mammals • Seagreen Boat Based Survey Summer 2017 Seagreen Alpha and Bravo Wind Farms – EIA Report 2018 • Kincardine Offshore Windfarm Environmental Statement Atkins 2016. Other applications will be monitored to see if any developments at the pre-consent phase release relevant information which

Organisation	Data source	Data provided
	pectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-000021-EN010098%20-%20Scoping%20Report.pdf Hornsea 2: https://tethys.pnnl.gov/sites/default/files/publications/EIAHornsea2.pdf Ossian: https://marine.gov.scot/sites/default/files/volume_2_-_technical_assessments_-_chapter_10_-_marine_mammals.pdf Outer Dowsing: https://www.outerdowsing.com/wp-content/uploads/2023/06/6.1.11_MarineMammals.pdf Outer Dowsing ES: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010130/EN010130-000442-6.3.11.1%20Chapter%2011%20Appendix%201%20Marine%20Mammals%20Technical%20Baseline.pdf Seagreen: https://marine.gov.scot/sites/default/files/chapter_10_marine_mammals.pdf Kincardine: https://marine.gov.scot/data/kincardine-offshore-windfarm-environmental-statement-and-appendices	can be used. Examples may include Dogger Bank South.
JNCC England Otter Survey Database (2023)	Otter sightings: https://www.gbif.org/dataset/3fa8e2b7-43c0-490e-b30e-b1902caa9bf0	Georeferenced records of occurrences of otter from national otter surveys in the UK.

Survey work

22.4.9 Extensive contemporary and historic information is available regarding abundance and distribution of marine mammals in the North Sea. Following a detailed review to inform

the scope of the data and assessment, as presented, no site-specific surveys were undertaken for this topic.

22.4.10 Marine mammal observations were carried out in compliance with the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, for the English Offshore Scheme geophysical survey campaigns. Recorded sightings have been used to inform the baseline.

22.4.11 Sediment and water samples acquired during the EGL 4 environmental baseline sample were tested for eDNA to provide an overview of species presence and movement throughout the draft Order Limits. Although not specifically focused on detection of marine mammals, presence has been noted in the baseline below.

22.5 Overall baseline

Current baseline

22.5.1 This chapter considers marine mammals and has been sub-divided into cetaceans (whales, dolphins and porpoise), pinnipeds (seals) and the European otter (*Lutra lutra*). Over 28 species of cetacean have been recorded in UK waters, either from observations or strandings records. Of these species, eleven are regular UK visitors, though only seven species are commonly encountered in the study area. Two species of pinniped are resident in UK waters: grey seal (*Halichoerus gryphus*) and common or harbour seal (*Phoca vitulina*). European otter although largely terrestrial can inhabit coastal areas and have been seen foraging in a narrow zone close to shore (<80 m) (NPWS, 2015, REF 22.15).

22.5.2 Marine mammals are protected by several national and international conventions including:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES. Aims to protect endangered plant and animal species from illegal trade and over-exploitation.
- Convention for the Protection of the Marine Environment of the Northeast Atlantic - OSPAR Convention. The OSPAR Convention aims to protect the marine environment of the Northeast Atlantic.
- International Union for Conservation of Nature and Natural Resources- IUCN. The IUCN Red Data list catalogues and highlights those animals and plants at high risk of global extinction.
- The Habitats Regulations - a collective term for The Conservation of Habitats and Species Regulations 2017 (as amended) (COHSR) and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (COMHSR)
- Natural Environment and Rural Communities (NERC) Act.
- Wildlife and Countryside Act 1981 (as amended in 1985).

22.5.3 Most notably, all cetaceans and otter are listed as EPS under the Habitats Regulations. The legislation applies to inshore and offshore waters and prohibits the "*deliberate and reckless capture, injury, killing and disturbance of marine EPS*" (JNCC, 2010 REF 22.16).

22.5.4 'Deliberate' has been interpreted by the European Commission (EC), in its 2007 'Guidance document on the strict protection of animal species of community interest under the Habitats Directive 92/43/EEC', as:

22.5.5 *"'Deliberate' actions are to be understood as actions by a person who knows, in light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against a species, but intends this offence or, if not, consciously accepts the foreseeable results of his action*".

22.5.6 Therefore, anyone carrying out an activity which they should reasonably have known could cause disturbance, and in rare cases injury, as defined in the Regulations, could be committing an offence.

22.5.7 It is important to note, that JNCC (JNCC et al., 2010 REF 22.16) guidance also considers that the potential for disturbance from some activities can be considered "trivial". Activities which might be considered trivial include those that lead to "*sporadic disturbances without any likely* negative *impact on the species*". For an activity to be considered "non-trivial", the JNCC et al., (JNCC 2010 REF 22.16) guidance states that "*the disturbance to marine EPS would need to be likely to at least increase the risk of a certain negative impact on the species' [Favourable Conservation Status] (FCS)".*

22.5.8 The purpose of this section is to provide a characterisation of the baseline environment with respect to the range, abundance, density and seasonality of species within and surrounding the draft Order Limits. This section has been split into the following sub-sections to provide an overview of the ecological baseline in the study area:

- Designated sites
- Cetaceans
- Pinnipeds
- European Otter
- Future Baseline

Designated Sites

22.5.9 Within the study area there are several designated sites which protect marine mammals. These are outlined in **Table 22-7** and illustrated in **Volume 3, Part 3, Figure 22-2: Designated Areas within Marine Mammal Qualifying Features**. Transboundary sites within 250 km of the draft Order Limits have also been assessed.

22.5.10 Site details are provided under the relevant qualifying feature baseline description in the following sub-sections.

Table 22-7 – Designated Sites and their qualifying features

Site Name & ID	Distance from Offshore Scheme	Qualifying Features	Conservation Objectives
22.5.11 Southern North Sea Special Area of	0 km Overlaps summer grounds (Northern):	22.5.14 Harbour porpoise	• Harbour porpoise is a viable component of the site

Site Name & ID	Distance from Offshore Scheme	Qualifying Features	Conservation Objectives
Conservation (SAC) 22.5.12 UK0030395	47.1 km for EGL 3 41.6 km for EGL 4 Overlaps winter grounds (southern): 2.2 km for EGL3 22.5.13 6.3 km for EGL 4		• There is no significant disturbance of the species • The condition of supporting habitats and processes, and the availability of prey is maintained (JNCC, 2019 REF 22.17)
Humber Estuary SAC 22.5.15 UK9006111	6.8 km	22.5.16 Grey seal	To ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • the extent and distribution of qualifying natural habitats and habitats of the qualifying species • the structure and function (including typical species) of qualifying natural habitats • the structure and function of the habitats of the qualifying species • the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • the populations of each of the qualifying species the distribution of qualifying species within the site
The Wash and North Norfolk SAC 22.5.17 UK0017075	22.5.18 16.1 km	Harbour seal 22.5.19 Otter	
Berwickshire and North Northumberland Coast SAC UK0017072	22.5.20 22.6 km	22.5.21 Grey seal	
Southern Trench Nature Conservation Marine Protected Area (NCMPA)	22.5.22 117.8 km	22.5.23 Minke whale	• Protection of an area containing persistently above average densities of minke whale where both juvenile and adult whales are regularly observed

Site Name & ID	Distance from Offshore Scheme	Qualifying Features	Conservation Objectives
			feeding (NatureScot, 2024 REF 22.18). • Preservation of a geologically unique shelf deeps feature on the Scottish continental shelf and its associated biological communities.
Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR) UK9006061	SSSI 51.9 km 22.5.24 NNR 63.8 km	22.5.25 Harbour seal	• Maintain or restore the favourable conditions for Harbour Seal
Klaverbank SAC/SCI NL2008002	129.1 km	Harbour porpoise Harbour seal 22.5.26 Grey seal	• Harbour Porpoise and Harbour Seal are viable components of the site. Maintain favourable conditions to Harbour Porpoise, Grey seal and Harbour seal (BISE, 2008 REF 22.19) • Maintain favourable conditions of designated species • Prevent the impacts of fishing and harvesting aquatic resources
Dogger Bank SAC/SCI NL2008001	135.3 km	Harbour porpoise Harbour seal Grey seal	• Maintain the favourable conditions of designated species (BISE, 2008 REF 22.20) • Prevent the impacts of fishing and harvesting of aquatic resources
Vlammse Banken SAC BEMNZ0001	240.8 km	Harbour porpoise Harbour seal Grey seal	• Maintain the favourable conditions of designated species (BISE, 2009 REF 22.21). • Prevent impacts such as pelagic trawling, benthic or

Site Name & ID	Distance from Offshore Scheme	Qualifying Features	Conservation Objectives
			demersal trawling and removal of sediments.
Doggerbank SAC DE1003301	241.9 km	Harbour porpoise Harbour seal	• Maintain the favourable conditions of designated species (BISE, 2004 REF 22.22). • Harbour Porpoise and Harbour Seal are viable components of the site • Prevent the impacts of netting, benthic or demersal trawling and other human intrusions and disturbances
Bancs des Flandres SAC FR3102002	246.3 km	Harbour porpoise Harbour seal Grey seal	• To maintain the favourable conditions of designated species (BISE, 2016 REF 22.23)

Cetaceans

22.5.27 Within the waters of the English Offshore Scheme, three cetacean species are regularly recorded, the harbour porpoise (*Phocoena phocoena*), white-beaked dolphin (*Lagenorhynchus albiostris*) and common minke whale (*Balaenoptera acutorostrata*). There are five other species that are considered regular but less common (ICES, 2016 REF 22.24; Hammond *et al.,* 2004 REF 22.25; Reid *et al.,* 2003 REF 22.26).

22.5.28 Large scale surveys to monitor cetacean population size have been carried out in UK Waters. These surveys were undertaken by Small Cetacean in European Atlantic Waters and North Sea (SCANS) and Cetaceans Offshore Distribution and Abundance in the European Atlantic (CODA) and were conducted in 1994, 2005 (SCANS II), 2016 (SCANS III) and 2022 (SCANS IV) (Gilles et al. 2023 REF 22.27). The English Offshore Scheme would pass through Block O and R as designated in the SCANS III survey, which were renamed to Block NS-C and NS-D in the more recent SCANS IV survey (Gilles et al., 2023 REF 22.27). These surveys provided density estimates for the region for specific species. The SCANS blocks in relation to the English Offshore Scheme are illustrated in **Volume 3, Part 3, Figure 22-3: SCANS III and SCANS IV Survey Blocks**.

22.5.29 Observations from the Sea Watch Foundation for the period of March 2023 - October 2024 have also been provided. The Sea Watch Foundation is a voluntary organisation which collates sightings from scientists and the public in a rolling manner, publishing data for typically a twelve-month period. Whilst the information cannot be used to inform abundance estimates it can indicate seasonality and presence of species. Data has also been taken from the National Network (NBN) Atlas, which holds observations of

species as far back as the 1900s for some species. Data for the period 2018 to 2022 was used to inform this PEIR Chapter.

22.5.30 In addition, to the above data sources, publicly available aerial data from the offshore wind farms in the region has also been used to support development of the baseline. Data from the following windfarms has been reviewed:

- Hornsea 3 OWF (surveys between 2016 to 2017)
- Dogger Bank (survey in 2013).
- Outer Dowsing, (from PEIR June 2023, and ES March 2024)
- Hornsea Project 2, (from technical document October 2012)
- Hornsea Project 4, (from technical document October 2018)
- Dogger Bank South, (ES report from 2014)
- Ossian (Array EIA report 2024)
- Seagreen (EIA Report 2018)
- Kidcardine (ES Report 2016)

Marine Mammal Observer Records and eDNA

22.5.31 A marine geophysical survey campaign was undertaken for the English Offshore Scheme between August 2023 and February 2024. During the survey, marine mammal observers were onboard recording observations. **During the** EGL 4 Project environmental survey eDNA samples were acquired. Harbour porpoise, white beaked dolphin, minke whale and northern bottlenose whale (*Hyperoodon ampullatus*) were detected at multiple stations.

22.5.32 Table 22-8 presents observations within the English Offshore Scheme survey area. Whilst this only provides a brief snapshot it can be noted that the observations align with the conclusion of the SCANS surveys that the three most common cetacean species in the region are northern minke whale, white-beaked dolphin and harbour porpoise. Grey seal are also frequently observed.

22.5.33 During the EGL 4 Project environmental survey eDNA samples were acquired. Harbour porpoise, white beaked dolphin, minke whale and northern bottlenose whale (*Hyperoodon ampullatus*) were detected at multiple stations.

Table 22-8: Marine Mammal Observations within English Offshore Scheme

Survey vessel	Survey area	Date	Species	Number	Distance from vessel	Geophysical source activity
Ievoli Cobalt	EGL 3 OFF	26/08/2023	Northern minke whale	1	250	Full power
Ievoli Cobalt	EGL 3 OFF	26/09/2023	White-beaked dolphin	2	450	Full power

Survey vessel	Survey area	Date	Species	Number	Distance from vessel	Geophysical source activity
Ievoli Cobalt	EGL 3 OFF	30/09/2023	Delphinidae sp.	1	725	Reduced power
Ievoli Cobalt	EGL 3 OFF	09/10/2023	Harbour porpoise	2	320	Not active
DEEP Seapal	EGL 3 OFF	11/10/2023	Grey seal	1	200	Not active
DEEP Seapal	EGL 3 OFF	12/10/2023	Harbour seal	1	150	Full power
Ievoli Cobalt	EGL 3 OFF	17/10/2023	Northern minke whale	1	700	Full power
Ievoli Cobalt	EGL 3 OFF	17/10/2023	Grey seal	1	100	Not active
Ievoli Cobalt	EGL 3 OFF	23/10/2023	Northern minke whale	1	100	Full power
Ievoli Cobalt	EGL 3 OFF	25/10/2023	Grey seal	1	100	Not active
Ievoli Cobalt	EGL 3 OFF	26/10/2023	Grey seal	1	100	Full power
Ievoli Cobalt	EGL 3 OFF	04/11/2023	Grey seal	1	50	Not active
Ievoli Cobalt	EGL 3 OFF	07/11/2023	Northern minke whale	1	100	Not active
DEEP Seapal	EGL 3 OFF	10/11/2023	Grey seal	1	400	Not active
DEEP Seapal	EGL 3 OFF	16/11/2023	Grey seal	1	300	Not active
Miranda	EGL 3 & EGL 4 Nearshore Lincolnshire	31/12/2023	Grey seal	1	-	Not active
Miranda	EGL 3 & EGL 4 Nearshore Lincolnshire	25/01/2024	Grey seal	1	-	Not active
Miranda	EGL 3 & EGL 4 Nearshore Lincolnshire	07/02/2024	Harbour porpoise	2	-	Not active
Miranda	EGL 3 & EGL 4	25/02/2024	Minke whale	1	500	Reduced power

Survey vessel	Survey area	Date	Species	Number	Distance from vessel	Geophysical source activity
	Nearshore Lincolnshire					
Miranda	EGL 3 & EGL 4 Nearshore Lincolnshire	28/02/2024	Grey seal	1	500	Full power

Harbour Porpoise (Phocoena phocoena)

22.5.34 The harbour porpoise is the smallest and most common marine mammal recorded within northwestern European continental shelf waters (JNCC 2015 REF 22.28). It has the highest population of any cetacean in the North Sea. Individuals can grow up to 1.6 m in length with females often slightly larger. Group sizes are small, typically comprising of 1 to 3 animals. Shy in nature, they rarely interact with boats and other animals so can be difficult to spot. Harbour porpoise must consume up to 10% of their body weight per day (Kastelein *et al*., 1997 REF 22.29; Lockyer *et* al, 2003 REF 22.30; Wisniewska et al., 2016 REF 22.31), since they have a high metabolism and smaller body size, they need a constant source of energy. The dominant prey species are sandeel, herring, whiting, gobies and sprat (Mahfouz *et al*., 2017 REF 22.32; Santos *et al*., 2004 REF 22.33)

22.5.35 Harbour porpoises are inclined to distribute themselves based on prey availability. Seasonal movements are linked to the maturity of their calves, with most mating and calving occurring between May and July (Robinson *et al*., 2007 REF 22.34; Learmonth *et al*., 2014 REF 22.35). Increases in inshore waters during the summer months is linked to the need for shelter, increase in energetic demand during calving, and lactation and distribution of prey (Weir *et al*., 2007 REF 22.36).

22.5.36 Harbour Porpoise populations are divided into management units around the UK, the area of the English Offshore Scheme is in the North Sea MU. These management units are only for conservation and human activity, Harbour Porpoise act as one continuous population in the North Atlantic.

22.5.37 In offshore waters, harbour porpoise like to avoid high current speeds, flat seafloor, and well mixed sediment (Heinanen & Skov, 2015 REF 22.37). Frequently, they are encountered in shallower continental shelf waters with a preference for waters at 50 m to 150 m depth (Isojunno *et al*., 2012 REF 22.38; Booth *et al*., 2013 REF 22.39).

Table 22-9: Harbour porpoise sightings and seasonality

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
Harbour porpoise	North Sea	All year	Common	Block O – 0.888 Block R 0.599	NS-C – 0.6027 NS-D – 0.5985	39 sightings with a max group size of 20	21 sightings	1007 sightings in 20 months (Atkins, 2016 REF 22.42) 365 sightings in 2 months (Seagreen 2018 REF 22.43)

Southern North Sea SAC

22.5.38 This SAC is an area of great importance to harbour porpoise in the UK. This site stretches from the central North Sea (North of Dogger Bank) to the Straits of Dover in the south, covering an area of 36,951 km^2 (JNCC, 2019 REF 22.17). It is estimated the site supports 17.5% of the UK North Sea population (JNCC, 2023 REF 22.44). The population size was estimated to be between 11,864 and 28,889 individuals in 2019 (JNCC, 2019a REF 22.45). Animals are believed to move latitudinally across the site between seasons; in the summer they are more commonly observed in the north section of the SAC, in winter they move to the south. As illustrated in **Volume 3, Part 3, Figure 22-4: Harbour Porpoise Density within the Southern North Sea SAC** the draft Order Limits overlaps the summer grounds for approximately 63.09 km²; and the winter grounds for approximately 5.7 km².

22.5.39 The mating season lasts from April to September, peaking in July and August, and calves are born between May and August. Animals move closer to the shoreline when breeding, and individuals move North in summer and South in winter months (Hammond et al., 2021 REF 22.46). Their densities in the summer grounds during August are 0.6-0.7 animals per km^2 in the English Offshore Scheme area. In the winter grounds during January densities reduce to 0.4-0.5 animals per km^2 in the area surrounding the English Offshore Scheme. The seasonal movement is believed to be linked with the variation in prey distribution (Gilles et al., 2016 REF 22.47; Gilles et al., 2009 REF 22.48).

22.5.40 As illustrated in **Volume 3, Part 3, Figure 22-4: Harbour Porpoise Density within the Southern North Sea SAC**, Dogger Bank represents an area of persistent high densities, with high densities recorded in the winter and summer months (Cucknell et al., 2017 REF 22.49), indicating that seasonal migration isn't consistent within all areas of the SAC. The English Offshore Scheme lies to the southwest of the Dogger Bank. Another persistent area of higher densities in both summer and winter is observed approximately 12 nautical miles from the coastline from Whitby to Flamborough Head. A portion of the English Offshore Scheme intersects with this area, although it lies outside of the Southern North Sea SAC. In this area, densities during summer peak at 0.7 animals per km^2. Figure data has been taken from the distribution maps of cetacean and seabird populations in the Northeast Atlantic, the animal densities are estimated along transects (Waggit, 2020 REF 22.50).

White-beaked dolphin (Lagenorhynchus albiostris)

22.5.41 The white-beaked dolphin has a short, often white, beak. It can grow up to 3.2 m in length, and they display vertical or side breaches with vessels as well as bow-riding. The species is also known to be sociable and mix with other dolphins and whales to assist in feeding. They are frequently recorded in the European continental shelf, mostly in central and northern North Sea but is occasionally observed in the southern North Sea. Most sightings are usually in June and October and inshore movements are associated with calving, which happens in June to September. Males will follow females inshore during this time (Canning *et al*., 2008 REF 22.51). Their distribution is also driven by prey. More feeding and nursing grounds are located further inshore, and in the northeast of England there is an area of important habitat between Whitley Bay and Amble, up to 150 individuals have been spotted. (Brereton *et al*., 2016 REF 22.52)., Towards the Anderby Creek Landfall in Humber sightings are less common but still occasional (Howes, 2004 REF 22.53).

Table 22-10 – White-beaked dolphin Sightings Data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
White-beaked dolphin	Celtic Greater North Sea	Summer	Occasional	Block O – 0.002 Block R – 0.243	NS-C – 0.0149 NS-D – 0.0799	7 sightings with a max group of 50	-	5 Sightings in 20 months (Atkins, 2016 REF 22.42) 5 sightings in 2 months (Seagreen 2018 REF 22.43)

Minke whale (Balaenoptera acutorostrata)

22.5.42 The minke whale is the most frequently observed and widely distributed of the baleen whales in UK waters. They are recorded throughout the northern and central North Sea but rarely visit the southern North Sea. One of the smallest baleen whales, they average at 8.5 m. Spy hopping and breaching are common for this whale, and they tend to form groups of three. Although species occurs year-round, most sightings have been recorded between May and September (JNCC, 2023 REF 22.54). Minke whales perform winter migrations between higher latitude summer feeding grounds and low latitude winter breeding grounds (Risch *et al*., 2014 REF 22.55).

Table 22-11 – Minke Whale Sightings Data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
Minke whale	Celtic and Greater North Sea	Summer	Rare	Block O–0.010 Block R–0.387	NS-C–0.0068 NS-D–0.0419	131 sightings with a max group of 40	14 sightings	1 sighting in 20 months (Atkins, 2016 REF 22.42) 16 sightings in 2 months (Seagreen 2018 REF 22.43)

Southern Trench NCMPA

22.5.43 The Southern Trench NCMPA lies off the coast of Aberdeenshire and contains a 250 m deep geological trench feature formed by glacial movements. This facilitates the creation of a highly productive mixing zone of upper and lower warm and cold waters which attracts shoals of herring, mackerel and cod to the area, as well as sandeel since the seabed is their preferred soft sand habitat. These conditions are ideal for Minke whales and they have been observed to move inshore from July onwards (Black and Cunningham, 2019 REF 22.56). Large proportions of these whales are juvenile, building up sufficient energy for the winter migration to breeding grounds. The area supports above average densities of the species compared to Scottish and English territorial waters (Paxton *et al.,* 2016 REF 22.57). This designated site is 117 km from the English Offshore Scheme, and despite the site itself not being impacted by any works on the English Offshore Scheme, whales migrating south may potentially cross through the draft Order Limits area in winter months.

Bottlenose dolphin (*Tursiops truncatus*)

22.5.44 The bottlenose dolphin is the largest dolphin species observed in UK waters and can grow up to 4 m. They display forward to sideways breaches, somersaults and tail slaps, and frequently bow ride. Like the white-beaked dolphin, bottlenose dolphin frequently mix with other species and their group sizes can be between 2 to 25 animals, though much larger groups are common in deep water. Resident populations are found in the Moray Firth in Scotland, but animals can be occasionally sighted in the North Sea (NatureScot, 2024 REF 22.58). There has been an increase in recordings of bottlenose dolphin in the inshore waters along the northeast coast of England, with peak sightings in the summer (Hackett, 2022 REF 22.59). Hackett indicates that some individuals may be permanently relocating to English waters and between 2014 and 2017 Aynsley (Aynsley et al., 2017 REF 22.60) identified 48 individuals utilising the Northumberland-Durham coastline. The movement of animals between the Moray Firth and the Tay Estuary, the two large residency grounds on the northeast coast of England, does have a seasonal pattern. They migrate from the Tay to the Moray Firth in early summer then from the Moray Firth to the Tay estuary in late summer (Arso Civil et al., 2021 REF 22.61). However, this pattern is not followed consistently by individuals, the movement is considered to be caused by social connections between dolphins, instead of changes in prey (Wilson *et al*., 2004 REF 22.62; Arso Civil *et al*., 2019 REF 22.63).

Table 22-12 – Bottlenose dolphin Sightings Data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
Bottlenose dolphin	Greater North Sea	All year	Occasional	Block R – 0.298 individuals per km	NS-C – 0.0419	131 sightings with a max group of 40	14 sightings	-

Short-beaked common dolphin (*Delphinus delphis*)

22.5.45 The short-beaked common dolphin is easily identified at sea by the hourglass pattern on their lower flank. They can grow up to 2.4 m in length and commonly breach and bow ride with vessels. Short-beaked common dolphin travel in groups of between 6 and 10, though some larger schools have been sighted (MarLIN, 2022 REF 22.64). They are mainly sighted during summer months (June to September). Common dolphins tend to feed on pelagic fish in the North Sea, such as whiting, mackerel, sandeel and sprat (Kessler, 2021 REF 22.65). Their seasonal movements and higher densities in summer are driven by prey availability and higher sea surface temperatures. (Murphy et al., 2013 REF 22.66; Neumann, 2001 REF 22.67; MacLeod et al., 2008 REF 22.68).

Table 22-13 – Short beaked common dolphin sighting data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
Short-beaked common dolphin	Celtic Greater North Sea	Summer	Occasional	-	NS-C – 0.0032	3 sightings with a max group of 10	-	-

Humpback whale (*Megaptera novaeangliae*)

22.5.46 Humpback whales are present worldwide in temperate, tropical and polar seas, typically favouring continental shelf waters and oceanic islands. They can reach up to 16 m in length and migrate annually from high latitude cold water feeding grounds in the summer to low latitude warm waters for breeding in the winter. They are usually observed individually or in a pair; groups rarely exceed 4 or 5 individuals when not feeding or breeding. Humpback whale populations have been severely depleted by over-exploitation, however, since the introduction of legal protection in 1955 their numbers have increased and they are considered occasional visitors to UK waters (Stevick et al., 2003 REF 22.69). Humpback whales are a member of the rorqual family with the characteristic ventral pleats of skin under the eye, and flat broad jaw, making it one of the easiest whales to identify.

Table 22-14 – Humpback Whale Sightings data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 (Hammond et al 2021 REF 22.46)	2022			
Humpback whale	n/a	-	Rare	n/a	-	3 sightings with a max group size of 2	-	-

Fin whale (*Balaneoptera physalus*)

22.5.47 The fin whale is also a baleen whale; slender bodied with a dark dorsal fin and small flipper and can reach up to 24 m in length. This is an open ocean whale, so is rarely seen near the coast in northwest Europe. They are occasionally observed off the coasts of north and northwestern Scotland and southern Ireland (MarLIN, 2008 REF 22.70).

Table 22-15 – Fin Whale Sightings Data

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar 2023-Oct 2024 (SeaWatch, 2024 REF 22.40)	NBN Atlas – Sighting 2020 – 2022 (NBN, 2023 REF 22.41)	OWF observations
				2016 2016 (Hammond et al 2021 REF 22.46)	2022			
Fin Whale	n/a		Rare	n/a	NS-D – 0.0009	-	-	-

Pinnipeds

Grey Seal ***(Halichoerus grypus)***

22.5.48 The grey seal is the larger of the two seal species found in UK waters. Most of their time is spent in open water, only coming to shore in the autumn to form breeding colonies. The at-sea distribution of grey seals is often characterised by gravel or sandy sediments, the ideal burrowing habitat of sandeel (McConnell et al., 2001 REF 22.71). Grey seals feed on a wide variety of prey including sandeel and gadids including cod, saithe and ling (Hammond & Wilson, 2016 REF 22.72). Models of at-sea density revealed distance was the primary driver of distribution, with predicted density declining within increasing distance from haul-outs.

22.5.49 The UK population comprises 36% of the global population of grey seal (JNCC, 2022 REF 22.73). They prefer remote islands, bays and caves as haul out areas, where they can give birth to pups and forage for food. Foraging areas can be up to 100 km offshore and are connected to the haul out by a corridor of use. Breeding takes place during the autumn period and gestation takes around 11 months. Exact pupping varies between year and location; in eastern England pupping occurs between November and December. A large proportion of the grey seal population will be on land and in coastal waters from October to December during pupping season, then again in February and March during the annual moult. During this time, they are particularly vulnerable to disturbance.

22.5.50 High usage areas at sea have been demonstrated along the east coast (Carter et al., 2022 REF 22.10). While the SACs in the east coast account for the majority of pup production (SCOS, 2021 REF 22.74), summer haul-out counts and at sea distribution reveals only a small percentage of seals utilise SACs during the summer foraging season (Carter et al., 2022 REF 22.10). Carter et al. (2022) analysis indicates between 21% and 58% of breeding females use different regions for breeding and foraging, suggesting at least some partial migration. The main breeding colonies in terms of pup production in the Southeast England SMU occur at Donna Nook, within the Humber Estuary SAC (for which grey seal is present but not a primary reason for site selection), Blakeney Point and Horsey Sands (SCOS, 2021 REF 22.74). Outside the breeding season the two haul out sites that hold the largest number of seals are Donna Nook and Scroby Sands, with other large haul outs at Blakeney Point and the sand banks in the northeast corner of The Wash close to Gibraltar Point (SCOS, 2021 REF 22.74).

22.5.51 Adjacent to the English Offshore Scheme, and within the Northeast England SMU, the Berwickshire and Northumberland Coast SAC has been designated for grey seal breeding. Here the Farne Islands account for more than 90% of the Northeast England SMU (SCOS, 2021 REF 22.74). Outside of the breeding season the major haul outs occur at the Farne Islands, Lindisfarne and Coquet Islands (SCOS, 2021 REF 22.74).

22.5.52 **Volume 3, Part 3, Figure22-5: Seal Density Distribution** illustrates that the at-sea mean population density changes across the English Offshore Scheme. At the Anderby Creek Landfall, densities are relatively low (0.009% per 25 km^2), as the landfall is south of the Donna Nook haul out. Densities increase to 0.03% per 25 km^2 after approximately 12 km, as the English Offshore Scheme traverses closer to the Donna Nook haul out. From about 40 km from the Anderby Creek Landfall, the density decreases to 0.01% per 25 km^2. Close to the English / Scottish border densities increase (to 0.02% to 0.03% per 25 km^2) for the EGL 4 Project as it passes close to the foraging areas associated with the Farne Islands and Lindisfarne.

22.5.53 Numerous telemetry tagging surveys have been carried out on seal from the haul out sites along the UK to inform offshore wind farm development. The Dogger Bank Teesside A & B (SMRU, 2014 REF 22.75) projects tagged 235 grey seals to identify if they used the offshore windfarm array area. The windfarm zone lies to the east of the English Offshore Scheme and grey seal from the coast would cross the English Offshore Scheme to access the site. Of the pups and adults tagged, two from Donna Nook, five from the Farne Islands, seven from the Isle of May and five from Abertay. This supports the previous conclusions that grey seal would be present throughout the English Offshore Scheme.

Humber Estuary SAC

22.5.54 The closest part of the draft Order Limits are approximately 4.1 km from the Humber Estuary SAC.

22.5.55 This SAC covers an area of 366.57 km^2 and includes the second largest coastal plain estuary in the UK. The range of salinity, substrate and exposure to wave action influences the estuarine habitats and the range of species that utilise them; these include grey seal, breeding bird assemblage, winter and passage waterfowl, river and sea lamprey, vascular plants and invertebrates (Natural England, 2014 REF 22.76). The main haul out site used throughout the year by grey seal on the Lincolnshire coast is Donna Nook; 7.7 km from the Anderby Creek Landfall (Humber Nature Partnership, 2023 REF 22.77). Regular seal population monitoring is undertaken at Donna Nook in the form of ground and aerial pup counts. Pupping occurs in June and July. The haul out was surveyed in summer 2023 and 2021, however, the count data was not publicly available for this PEIR chapter. In 2018 there was an estimated pup count of 2,066 (ground count) with a total population count of 6,288 (SCOS, 2022 REF 22.11). SCOS (2022) notes for the ten-year period up to 2018, a significant growth in SMUs on the east coast of England. However, the 2019 count in the larger Southeast England SMU showed an approximate 25% decline than the previous 5 years. Counts for 2020, 2021 and 2022 (although not published) confirmed that this decline has continued.

22.5.56 Berwickshire and Northumberland Coast SAC

22.5.57 The closest point of the draft Order Limits are approximately 22.8 km from the Berwickshire and Northumberland Coast SAC.

22.5.58 This SAC stretches from Fast Castle Head in Scotland to Alnmouth in England, encompassing both Lindisfarne and the Farne Islands. The site covers an area of 652.26 km^2 and supports a breeding colony of grey seal which is around 2.5% of annual UK grey seal pup production (JNCC, 2023a REF 22.78). Key haul out sites include Staple Island within the Farne Islands and Holy Islands sands, Lindisfarne.

Harbour Seal (*Phoca vitulina*)

22.5.59 The harbour seal is frequently found in British estuaries and on mudflats. Though they spend much of their time at sea they do require land for breeding purposes and therefore haul-out locations are important. The UK population represents 5% of the global harbour seal population and 32% of the European population (SCOS, 2021 REF 22.74). Foraging areas are much smaller compared to those of grey seal and are typically located within 40 - 50 km (JNCC, 2022a REF 22.79) of their haul out site. They feed on a variety of prey species including sandeel, gadoids, herring, sprat, flatfish, octopus and squid. Their diet varies between seasons and regions, off the coast of

Lincolnshire their prey is mainly sandeel, gadoids and flatfish (Sharples et al., 2009 REF 22.80).

22.5.60 The harbour seal has a slightly shorter gestation period than the grey seal of 10 months. Pupping occurs on land from June to July while the moult is centred around August and extends into September. Harbour seals do not tend to congregate at breeding colonies, with pups able to swim from birth. Rather, they spend most of the time hauled-out during the annual moult (Morris et al., 2021 REF 22.81). Females will lactate for 21 days after birth in June or July before weaning, during this time the female will forage at sea, returning regularly to the pup, limiting at sea distribution. Population counts are conducted in moult and are representative of the highest proportion of the population (SCOS, 2021 REF 22.74). The most recent counts of haul outs recorded only 79 in the Northeast England SMU and 4,852 in the Southeast England SMU.

22.5.61 Inshore studies show that harbour seals prefer foraging in waters less than 50 m deep and within 30 km to 50 km of the coastline. Particularly during moults, they must remain close to haul out sites. Movements are variable, some individuals travel more than 100 km to sandbank habitats for foraging (Cunningham et al., 2009 REF 22.82; Jones et al., 2015 REF 22.83). This is a possible reflection of competition for food in overpopulated feeding grounds, harbour seal movements are based on distribution of prey (Vance et al., 2021 REF 22.84; Sharple et al., 2021 REF 22.85).

22.5.62 **Volume 3, Part 3, Figure 22.5 Seal Density Distribution** illustrates that the at-sea mean population density changes across the English Offshore Scheme has a higher density right at the Anderby Creek Landfall, with a mean population density of 0.03%. This stays high for 30 km and then drops to 0.001% further ashore.

22.5.63 *The Wash and North Norfolk Coast SAC*

22.5.64 The closest point of the draft Order Limits are 16.3 km away from The Wash and North Norfolk Coast SAC.

22.5.65 The SAC encompasses the largest embayment in the UK covering an area of 1,078 km^2. The extensive intertidal flats here and on the North Norfolk Coast provide ideal conditions for harbour seal breeding and hauling-out in the UK, supporting some 7% of the total UK population. The main harbour seal haul-out site is in the Wash on the Lincolnshire/Norfolk coast. The Mean number of harbour seals counted here between 2019 and 2021 was 2,659 (Thompson & Russel 2021 in SCOS, 2021 REF 22.86). Harbour seals have also been observed hauling out at Donna Nook in Lincolnshire, the mean count here between 2019 and 2021 was 130 (Thompson and Russell, SCOS, 2021 REF 22.86). The survey results show significant declines in the population of harbour seals.

22.5.66 *Teesmouth and Cleveland Coast SSSI and NNR*

22.5.67 The Teesmouth NNR is underpinned by the Teesmouth and Cleveland SSSI. Harbour seals historically inhabited the mouth of the River Tees but were absent for much of the 20th century due to pollution. The area has been recolonised by Harbour seal in the 1980s, forming a regular breeding colony. Here up to 162 seals have been recorded hauled out in 2022, with 36 pups recorded (Bond, 2022 REF 22.87) These seals are now present year-round in the estuary and tidal tees, with regular haul outs at Greatham Creek and Seal Sands. Pupping occurs in June and July on the intertidal mud of Seal Sands. The closest part of the draft Order Limits lie approximately 63.8 km from the Teesmouth NNR, and 1.9 km from the Cleveland Coast SSSI.

European Otter (Lutra lutra)

22.5.68 The European otter is a solitary semi-aquatic mammal which occurs in a variety of aquatic habitats such as rivers, streams, lakes, estuaries and on the coast. Coastal dwelling populations use shallow, inshore marine areas for feeding. Fresh water is used for bathing, and terrestrial areas for resting and breeding. Foraging is limited to coastal areas (JNCC, 2022b REF 22.88); the range is dependent on the quality of its habitat and food. There is evidence of otters travelling as far as 80 km for food, but it is more common for their range to be 10 to 40 km along the coastline. Most feeding is done in waters no less than 3 m deep, but otters are capable of hunting in waters 10 m deep. They can be sighted all year round but observations tend to peak in May, June, September and October. They have no seasonality, but sightings are rare in the study area; the Anderby Creek Landfall has only had five sightings between 2012 and 2022 (NBN Atlas, 2023 REF 22.89).

22.5.69 *The Wash and North Norfolk Coast SAC*

22.5.70 The closest part of The Wash and North Norfolk Coast SAC lies 16.3 km from the draft Order Limits.

22.5.71 The draft Order Limits and Anderby Creek Landfall falls within the foraging range of European otter from within The Wash and North Norfolk Coast SAC. Otters occur along the North Norfolk coast and can be found in a variety of freshwater and coastal habitats. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

Future baseline

22.5.72 The existing conditions of the study area are relatively stable. Marine mammal populations naturally change over spatial and temporal scales and therefore fluctuations are likely to occur over the lifetime of the English Offshore Scheme. The abundance and distribution of prey is typically what influences the movement of marine mammal populations. Many species can adapt to gradual changes in environment, as their areas of feeding cover large distances, so climate change can be adapted too. However, not all species are as adaptational, and anthropogenic activities can alter global trends. For example, grey and harbour seals may be less resilient to long term changes due to them having more restrictive foraging grounds.

22.5.73 The main impacts of anthropogenic climate changes so far have been identified as decreasing ocean productivity, altered food web dynamics, reduced abundance of habitat-forming species, shifting species distributions and a greater incidence of disease. The North Sea has seen one of the greatest increases in sea surface temperature in the past 25 years, a rate of increase of 0.6°C and 0.8 °C.

22.5.74 A shift in distribution could occur in species vulnerable to temperature changes, such as white-beak dolphin. There is a lot of uncertainty however about the details in timescale and location for white-beaked dolphin movements, but there is a clear alteration in ocean systems. White-beaked dolphin is endemic to cold temperatures of the North Sea, increasing water temperature reduces the areas suitable for foraging and habitat loss (IJsseldijk et al., 2018 REF 22.90). Analysis of strandings data has suggested a potential change in their distribution along the North Sea coastline, particularly in southern regions where fewer animals are present. Due to their widespread abundance, the white-beaked dolphin was evaluated as a least concern, despite their range expecting to shrink due to rising sea temperature (Macleod et al., 2008 REF 22.91).

22.5.75 Grey seal populations have been increasing in the North Sea since the 1960s. Between 2010 and 2016, pup production has increased by 12% per year due to the rapid expansion of newer colonies in Lincolnshire. The data suggests there may have been some immigration to colonies further south, since the rate of increase in the southern North Sea has been lower in recent years, suggesting populations around the east coast of England may be reaching carrying capacity. Pup production in the Berwickshire and North Northumberland Coast SAC is continuing to increase and does not show any indication of reaching an asymptote (SCOS, 2020 REF 22.92). An analysis of Persistent Organic Pollutants (POPs) in blubber from grey seal pubs revealed that there were concentrations that could cause a severe toxic effect (Robinson et al., 2019 REF 22.93). Other threats include entanglement in marine and plastic debris, particularly ghost fishing gear.

22.5.76 Harbour seal numbers similarly have gradually increased since the 2000s. For the East coast seal counts are stable, however, the 2017 count was 3.9% lower than 2016. This is potentially indicating that the population is reaching carrying capacity earlier than anticipated. In 2002, there was an epidemic called the phocine distemper virus (PDV), the southeast population of harbour seals have recovered from this. There is a high chance that climate change will cause a subtle shift in distribution, but based on current trends and epidemics it will be difficult to record the impacts across the marine mammal's study area. Other studies suggest that harbour seal might have been exposed to domoic acid via consumption of contaminated prey. This may have the potential to cause harmful and lethal effects that disrupt population dynamics. Due to the declines recorded, the current UK harbour seal population estimate has been considered as unfavourable and inadequate.

22.5.77 In the North Sea, the harbour porpoise is considered vulnerable to bycatch in gillnets used in commercial fishing. If the fishing vehicle is travelling at over 12 nm, Northridge et al (Northridge et al 2019 REF 22.94) estimated a bycatch of harbour porpoise between 845 to 1633 individuals. Another driver is that harbour porpoise has a high metabolic rate and need to feed regularly, the distribution in porpoise reflects the availability and energy density of prey species (Santos and Pierce, 2003 REF 22.95). IAMMWG et al., (IAMMWG 2015 REF 22.96) has reported that necropsies of harbour porpoise strandings have revealed parasitic infections that suggest adverse effects with an anthropogenic origin, such as discharges of POPs. The impact of climate change remains poorly understood, there populations for now remain stable, as there appears to be no change in harbour porpoise range since 1994 (Paxton et al., 2016 REF 22.57; JNCC, 2019a REF 22.45).

22.5.78 The populations of bottlenose dolphins off the east coast England have increased (Arso Civil et al., 2019 REF 22.61; Arso Civil et al., 2021 REF 22.63). The group sizes of bottlenose dolphin are directly related to an abundance in fish prey but can also be related to social bonds within the population. The overall assessment of prospects, and conservation status for bottlenose dolphin is unknown (JNCC, 2019b REF 22.97). The impacts affecting their available habitat are not thought to be increasing, and there are no threats identified likely to impact in the next 12 years.

22.5.79 In UK waters, minke whale's major threats are the direct and indirect interactions with fisheries. In Scotland, examination of minke whale strandings between 1990 and 2010 noted that 50% were due to entanglement in static fishing gear (Northridge et al., 2010 REF 22.98). Other threats include boat strikes, exposure to anthropogenic noise, ingestion of contaminants and the loss of critical habitat (Gill et al., 2000 REF 22.99; Robinson et al., 2019 REF 22.100). Whale abundance in the greater North Sea is stable (OSPAR IA, 2017REF 22.101; JNCC, 2019d REF 22.102) and there is no evidence to

support that the range of minke whale has changed since 2013 (JNCC, 2019d REF 22.102).

22.6 Environmental measures

22.6.1 As set out in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**, the environmental measures are characterised as design measures or control and management measures. A range of environmental measures would be implemented as part of the English Offshore Scheme and will be secured in the DCO as relevant. **Table 22-16** outlines how these design and control measures will influence the marine mammal assessment.

22.6.2 Several management plans will be provided as Outline Management Plans with the DCO application to support the Deemed Marine Licences. These will include an Outline Construction Environmental Management Plan (CEMP), Outline Marine Pollution Contingency Plan, and Outline Marine Mammal Mitigation Plan (MMMP). These documents will outline measures to be implemented to comply with legislation (e.g., in relation to the prevention of oil and chemical spills) and best industry practice (e.g., implementation of JNCC guidance to reduce impacts on marine mammals from underwater noise during geophysical surveys) during all phases of the English Offshore Scheme. Final management plans will be submitted in accordance with the dMLs to discharge the licence conditions. An Outline CEMP can be found in **Volume 2, Part 1, Appendix 1.5.C Outline Construction Environmental Management Plan**. In addition, design measures identified through the EIA process have been applied to avoid or reduce potential significant effects. Design measures included that are relevant to Marine Mammals and Marine reptile receptors are included in **Table 22-16** below and are also included in **Volume 2, Part 1, Appendix 1.5.A: Outline Register of Design Measures.**

Table 22-16 – Summary of the environmental measures

Receptor	Potential changes and effects	Embedded measures
Cetaceans and Pinnipeds	Collision with Project Vessels	All vessels (exceeding 20 m) shall not exceed 14 knots during construction operations within the English Offshore Scheme to protect marine mammals from ship strikes.
Cetaceans and Pinnipeds	Underwater Noise	Sub-bottom profiling shall comply with the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals.
Cetaceans and Pinnipeds	EMF	HDVC poles would be bundled to minimise the effects of EMF for electrosensitive receptors

22.7 Scope of the assessment

Spatial scope and study area

22.7.1 The spatial scope of the assessment of marine mammals covers the area of the English Offshore Scheme contained within the draft Order Limits, together study areas

described in **Table 22-5** and illustrated in **Volume 3, Part 3, Figure 22-1: Marine Mammal Study Area.**

Temporal scope

22.7.2 The temporal scope of the assessment of marine mammals is consistent with the period over which the English Offshore Scheme would be carried out. It assumes construction of the English Offshore Scheme would commence at the earliest 2028 and cover a period of 6 years of total construction time. Operation would commence in 2033 with periodical maintenance required during the operational phase of the English Offshore Scheme. It is assumed that maintenance and repair activities could take place at any time during the life span of the English Offshore Scheme.

22.7.3 The English Offshore Scheme is expected to have a life span of more than 40 years. If decommissioning requires cessation of operation and removal of infrastructure at this point in time, then activities and effects associated with the decommissioning phase are expected to be of a similar level to those during the construction phase works, albeit with a lesser duration of two years. The Projects could also remain operational for a period after the 40 years or be taken out of service and left within the draft Order Limits after 40 years. Acknowledging the complexities of completing a detailed assessment for decommissioning works up to 40 years in the future, based on the information available, the Project has concluded that impacts from decommissioning would be no greater than those during the construction phase. Furthermore, should decommissioning take place it is expected that an assessment in accordance with the legislation and guidance at the time of decommissioning would be undertaken.

Identification of receptors

22.7.4 The principal marine mammal receptors that have been identified as being potentially subject to significant effects are summarised in **Table 22-17**.

Table 22-17 – Marine mammal receptors subject to potential effects

Receptor	Reason for consideration
Harbour porpoise	These three cetacean species are European Protected Species that are commonly observed with the English Offshore Scheme throughout the year.
White-beaked dolphin	
Minke whale	
Other cetacean species	Whilst other cetacean species are only occasional visitors to the English Offshore Scheme, all cetacean species are designated European Protected Species and must be considered by the Environmental Impact Assessment.
Grey seal	Both UK species of pinniped are known to be present within the English Offshore Scheme throughout the year.
Harbour seal	
European otter	Otters are a European Protected Species and although rarely seen within the English Offshore Scheme, the draft Order Limits is

Receptor	Reason for consideration
	within their foraging range from The Wash and North Norfolk Coast SAC where they are a qualifying feature.
Nationally designated sites with a marine mammal qualifying feature including Southern Trench NCMPA and Teesmouth and Cleveland Coast SSSI / NNR (see **Volume 3, Part 3, Figure 22-2: Designated Areas within Marine Mammal Qualifying Features**)	These sites of national importance are within the relevant study areas for the species which they are designated for. MCZ Assessment screening has been provided as **Volume 2, Part 3, Appendix 3.17.B: MCZ Assessment Screening.** Screening concluded that the Southern Trench NCMPA did not require a Stage 1 Assessment.
European sites designated for marine mammal features including Southern North Sea SAC, Humber Estuary SAC, Berwickshire and North Northumberland Coast SAC, The Wash and North Norfolk Coast SAC (see **Volume 3, Part 3, Figure 22-2: Designated Areas within Marine Mammal Qualifying Features**)	These sites of international importance are within the relevant marine mammal management units for the species for which they are designated for. HRA screening has been provided as **Volume 2, Part 3, Appendix 3.17.A: Habitats Regulations Assessment Screening Report.** Screening concluded that potential likely significant effects on the Southern North Sea SAC could not be ruled out. The impacts on this European site will be considered in a Report to Inform Appropriate Assessment to be submitted with the ES as per the Habitats Regulations.

Potential effects considered within this assessment

22.7.5 The effects on marine mammal receptors which have the potential to be significant and have been taken forward for detailed assessment are summarised in **Table 22-18**. All potential likely significant effects identified are relevant for each of the three phases of the English Offshore Scheme: construction, operation (including repair and maintenance) and decommissioning.

Table 22-18 – Marine mammal receptors scoped in for further assessment

Receptor	Likely significant effects
Cetaceans Pinnipeds	**Temporary habitat loss/seabed disturbance** from activities such as pre-sweeping of sand-waves, cable burial and trenching, cable repair and cable removal.
Cetaceans Pinnipeds Southern North Sea SAC	**Permanent habitat loss** from the deposit of external cable protection.

Receptor	Likely significant effects
Cetaceans Pinnipeds European otter All relevant European and nationally designated sites for marine mammals as identified in **Table 22-7**	**Changes in prey availability** as an indirect result of temporary and permanent habitat loss.
Cetaceans Pinnipeds Southern North Sea SAC	**Underwater noise changes** from the presence of project vessels and equipment (including cable trenching)
Cetaceans Pinnipeds Southern North Sea SAC	**Underwater noise changes** from geophysical survey
Cetaceans Pinnipeds Southern North Sea SAC	**Underwater noise changes** from UXO detonation
Cetaceans Pinnipeds Southern North Sea SAC	**Collision with project vessels and equipment**

22.7.6 The receptors/effects detailed in **Table 22-19** have been scoped out from being subject to further assessment because the potential effects are not considered likely to be significant.

Table 22-19 – Summary of effects scoped out of the marine mammal assessment

Receptors/potential effects	Justification
Cetaceans **Electromagnetic changes/barrier to species movement**	An EMF study was undertaken for the EGL 3 and EGL 4 cable systems. It calculates that EMF fields on the seabed immediately above the cables would reach 75.4 µT but would attenuate to background levels within 0.5 m of the bundled cables. Cables would be buried to at least 0.5 m reducing the EMF levels at the seabed. It is acknowledged that cetaceans use magnetic cues, such as the earth's geomagnetic field, to navigate. The mechanism for how this is achieved is still unknown (BOEMRE, 2011 REF 22.103). Gillet *et al*., (Gillet et al, 2005 REF 22.104) reports that there have been no impacts to the migration of cetaceans over existing interconnector cables and Walker., (Walker et al, 2001 REF 22.105) notes that harbour porpoise migration across the Basslink has been observed unhindered despite several crossings of operating subsea HVDC cables. Given the rapid attenuation of the magnetic field, the lack of evidence of effects on cetaceans, and the predominantly pelagic

Receptors/potential effects	Justification
	existence resulting in separation with the change in field, cetaceans have a low likelihood of being affected by EMF. Therefore, the impact pathway has been scoped out of the EIA. The Planning Inspectorate agreed with the scoping decision (ID 5.5.2).
Pinnipeds and European Otter **Electromagnetic changes/barrier to species movement**	No evidence of magnetic sensitivity has been reported for pinnipeds (BOEMRE, 2011 REF 22.103). Otters forage within 80 m of the shoreline. Cables at this point would be laid within cable ducts approximately 10 m deep. There would be no EMF changes at the seabed within the otter foraging range. The Planning Inspectorate agreed with the scoping decision (ID 5.5.2).
Cetaceans Pinnipeds European otter **Temperature increase**	Calculations have been undertaken for the EGL 3 and EGL 4 cable systems to determine the heat profile under full load and at maximum operating temperature (the worst-case scenarios). Calculations assumed a burial depth of 2 m and a maximum operating temperature of the cables of 90 °C. Heat plots illustrating that heat rapidly dissipates from the cables are presented in **Volume 1, Part 1, Chapter 4: Description of the Projects.** Seabed surface temperatures will not change from the predicted ambient temperature of 12°C. Sediment temperature at 0.5 m depth, immediately above the cables, is predicted to reach 20°C. It should be noted that the actual system is unlikely to reach these temperatures as the system would have to operate at full load continuously for an extended period of time (months/years) to meet these temperatures. In reality, the system would not be at full load for this long and therefore the temperature will fluctuate and be unlikely to reach these maximums. As the temperature changes will be localised to the immediate environment surrounding the cables and restricted to below 0.5 m and deeper (below the burrowing depth of most infauna), they will be within the fluctuations associated with natural temperature fluctuations. There will be no warming of the water column. Therefore, there is not considered to be a source-receptor pathway for marine mammals and there will be no indirect impacts on prey species. The Planning Inspectorate agreed with the scoping decision (ID 5.5.2).
Cetaceans Pinnipeds European otter **Accidental Spills (Hydrocarbon & PAH contamination)**	Projects' vessels and the Contractors would comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 which relate to pollution from oil from equipment, fuel tanks etc and release of sewage (black and grey water). It is a legal requirement that all vessels have a SOPEP. An Emergency Response Plan and Marine Pollution Contingency Plan would be in place for all Phases of the English Offshore Scheme. Compliance with Regulations would be sufficient to minimise the risk to the environment.

Receptors/potential effects	Justification
Cetaceans Pinnipeds European Otter **Visual Disturbance**	The physical presence of the Projects' vessels and equipment during all phases of the Projects have the potential to disturb marine mammals. Seals are more sensitive to anthropogenic disturbance when hauled out. Wilson., (Wilson, 2013 REF 22.106) presents a review of such studies, and concludes that as an overall generalisation, unless habituation has been established by frequent non-intrusive visits, a safe boat distance for hauled out harbour and grey seals (i.e., one at which there is a low risk of significant numbers of seals flushing) is about 200 m. Donna Nook, the closest seal haul out lies 8.8 km away at the draft Order Limits closest point and therefore, there is no impact pathway. The region is already used by large ships and ferries and animals are therefore habituated to a certain degree to the presence of vessels. The presence of Projects' vessels would be temporary and transient, restricted to discreet activities and periods and would not increase the shipping baseline other than briefly. Vessels would be moving slowly (circa 5 knots) whilst within the English Offshore Scheme. Therefore, no potential significant disturbance effects are predicted from the presence of Projects' vessels and the impact pathway has been scoped out of the EIA.

22.8 Key parameters for assessment

Realistic worst-case design scenario

22.8.1 The assessment has followed the Rochdale Envelope approach as outlined in **Volume 1, Part 1, Chapter 4: Description of the Projects** and **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology** of the PEIR. The assessment of effects has been based on the description of the Projects and parameters outlined in **Volume 1, Part 1, Chapter 4: Description of the Projects**. However, where there is uncertainty regarding a particular design parameter, the realistic worst-case design parameters are provided below with regards to marine mammals along with the reasons why these parameters are considered worst-case. The limit of deviation is currently not confirmed, though the worst-case scenarios do not exceed the maximum parameters set out within the Project description.

22.8.2 The preliminary assessment for marine mammals has been undertaken on this basis. Effects of greater adverse significance are not likely to arise should any other development scenario, based on details within the Rochdale Envelope (e.g., different infrastructure layout within the draft Order Limits), to that assessed here be taken forward in the final design scheme.

22.8.3 In relation to marine mammals the following assumptions presented in **Table 22-20** and **Table 22-21** are made regarding the Project design parameters in order to ensure a realistic worst-case assessment has been undertaken.

22.8.4 With regards to underwater noise changes, it is assumed that UXO clearance is undertaken under a separate Marine Licence application, subject to its own environmental assessments. A high-level overview of the noise modelling for clearance

is provided in the preliminary environmental assessment and will be included in the ES, to provide a holistic overview of everything that may be needed during construction.

Table 22-20 - EGL 3 Project worst-case assumptions

Impact Pathway	Construction	Operation	Decommissioning	Most sensitive location or scenario
Temporary habitat loss/ seabed disturbance	13.20 km^2	To be confirmed	Similar footprint as is disturbed during construction and operation combined.	Cetaceans, Pinnipeds
Permanent habitat loss	0.915 km^2	To be confirmed	No new deposits but assumes cable protection remains in place.	Cetaceans, Pinnipeds

Table 22-21 - EGL 4 Project worst-case assumptions

Impact Pathway	Construction	Operation	Decommissioning	Most sensitive location or scenario
Temporary habitat loss/ seabed disturbance	12.75 km^2	To be confirmed	Similar footprint as is disturbed during construction and operation combined.	Cetaceans, Pinnipeds,
Permanent habitat loss	1.135 km^2	To be confirmed	No new deposits but assumes cable protection remains in place.	Cetaceans, Pinnipeds,

22.8.5

Consideration of construction scenarios

22.8.6 As detailed in **Volume 1, Part 1, Chapter 4: Description of the Projects**, the timing of construction activities set out within this PEIR is indicative. To allow for any unexpected circumstances and a realistic worst-case assessment, the impact assessment for the English Offshore Scheme considers the following construction scenario to ensure the worst-case scenario for marine mammals can be identified and assessed:

- EGL 3 and EGL 4 are constructed sequentially, and construction activities do not overlap. This is equivalent to the 6-year period, mentioned in Section Temporal scope over which marine mammals would be subject to effects.
- EGL 3 and EGL 4 are constructed in parallel and construction activities overlap temporally. This would be within the 6-year period, reducing the time over which marine mammals would be subject to effects but potentially increasing the magnitude of impacts.

22.9 Assessment methodology

Overview

22.9.1 The generic project-wide approach to the assessment methodology is set out in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**, and specifically in **Sections 5.4** to **5.6**. However, whilst this has informed the approach that has been used in this marine mammal assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this marine mammals assessment. Details are provided below.

22.9.2 The criteria for characterising the value and sensitivity and magnitude for marine mammals are outlined in **Table 22-22**: Definitions of sensitivity for marine mammals and **Table 22-23**: Definitions of impact magnitude criteria for marine mammals respectively.

22.9.3 The assessment of sensitivity will be made with consideration of the vulnerability of the receptor to an impact and its ability to recover and adapt. Vulnerability can differ between different groups and species of marine mammal and will also vary depending on the impact pathway. For example, seal species are more sensitive to visual disturbance than cetaceans, whilst sensitivity to underwater noise changes differs between cetacean species depending on their ability to hear and detect certain frequencies.

22.9.4 Cetaceans and otter are European Protected Species, protected by the Habitats Regulations, and are therefore considered to be of very high importance. The two species of pinniped present in the UK are nationally protected and are also considered to be of high importance. Because of this the concept of value does not allow the assessment to differentiate between sensitivity, as such when considering Receptor value or sensitivity, sensitivity to the impact pathway has been used as the main differentiator in the assessment. It should be noted that due their importance, these species are also considered in HRA process as required by the Habitats Regulations.

22.9.5 The assessment of magnitude will be made with consideration of the extent of the area impacted, the duration and frequency of the impact and the scale of the change i.e., whether it has an effect at an individual or population level. When determining the magnitude of impacts the life history and ecology of the receptors is important. Factors such as seasonality of presence or whether specific areas are required for a certain life stage which the species may be unwilling or unable to move away from are considered.

22.9.6 The ecological impact assessment will use available evidence, professional judgement and knowledge of marine mammal ecology and behaviour to determine the level of impact.

22.9.7 The significance of an effect, either adverse or beneficial, will be determined using a combination of the magnitude of the impact and the sensitivity of the receptor. A matrix approach is used throughout all topic areas to ensure a consistent approach within the assessment. This is described further in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology,** and is replicated for ease in **Table 22-24**.

Table 22-22: Definitions of sensitivity for marine mammals

Receptor sensitivity	Description
22.9.8 High	22.9.9 No tolerance and ability to adapt behaviour so that survival and reproduction rates are affected and the population cannot recover. Recovery will take longer than 10 years following the cessation of activity or will not occur. 22.9.10 The licensable activity is taking place during a sensitive season.
22.9.11 Medium	22.9.12 Limited tolerance and ability to adapt behaviour so that survival and/or reproduction rates may be affected and/or limited ability for the animal to recover. Recovery to pre-impact conditions is possible between 5 and 10 years.
22.9.13 Low	22.9.14 Some tolerance such as ability to adapt behaviour or recover from any impact so that survival is not affected, and reproduction rates are not affected in the medium term. Recovery to pre-impact conditions between 1 and 5 years.
22.9.15 Negligible	22.9.16 Receptor is able to adapt behaviour so that survival and reproduction rates are not affected. 22.9.17 Recovery expected to be relatively rapid, i.e., less than approximately six months following cessation of activity.

Table 22-23: Definitions of magnitude criteria for marine mammals

Impact Magnitude	Definition
22.9.18 High	22.9.19 The impact will affect the behaviour and distribution of sufficient numbers of a species, that the favourable conservation status for the relevant management unit/population is adversely affected.
22.9.20 Medium	Temporary changes in behaviour and/or distribution of individuals during a key season such that it would result in potential reductions to reproductive success for the population. 22.9.21 Permanent effects on individuals that my influence survival but not at a level that would affect the favourable conservation status of the population.
22.9.22 Low	22.9.23 Short-term and/or intermittent and temporary behaviour effects in a small proportion of the population. Survival and reproductive rates very unlikely to be impacted to the extent that population effects are measured.
22.9.24 Negligible	22.9.25 Very short term, recoverable effect on the behaviour and/or distribution in a very small proportion of the population.

Table 22-24: Significance matrix

		Sensitivity			
		High	Medium	Low	Negligible
22.9.26 Negative magnitude	22.9.27 High	22.9.28 Major	22.9.29 Major	22.9.30 Moderate	22.9.31 Minor
	22.9.32 Medium	22.9.33 Major	22.9.34 Moderate	22.9.35 Minor	22.9.36 Minor
	22.9.37 Low	22.9.38 Moderate	22.9.39 Minor	22.9.40 Minor	22.9.41 Negligible
	22.9.42 Negligible	22.9.43 Minor	22.9.44 Minor	22.9.45 Negligible	22.9.46 Negligible
22.9.47 Beneficial magnitude	22.9.48 Negligible	22.9.49 Minor	22.9.50 Minor	22.9.51 Negligible	22.9.52 Negligible
	22.9.53 Low	22.9.54 Moderate	22.9.55 Minor	22.9.56 Negligible	22.9.57 Negligible
	22.9.58 Medium	22.9.59 Major	22.9.60 Moderate	22.9.61 Minor	22.9.62 Negligible
	22.9.63 High	22.9.64 Major	22.9.65 Major	22.9.66 Moderate	22.9.67 Minor

Preliminary assessment of cumulative effects

22.9.68 At the current stage of the Projects (PEIR stage), design information for the Project is insufficient to allow for a robust cumulative assessment to be undertaken. Furthermore, given the current position in relation to baseline data collection, with much of the Onshore environmental surveys still to be undertaken during 2025, the baseline identified at this PEIR stage cannot be taken as a complete picture of the potential presence and significance of sensitive receptors. Therefore, a cumulative assessment has not been undertaken at this stage; however, **Volume 1, Part 4, Chapter 28: Cumulatives**, presents the long and short lists of 'other developments' which will be considered at the ES stage, and the methodology which allowed for the identification of these other developments, to allow consultation bodies to form a view and provide comment on the other developments included. The long-list will be reviewed and if necessary, updated, in the lead up to the ES, as the Projects design further evolves and in response to any comments raised at statutory consultation

22.10 Preliminary assessment of Temporary Habitat Loss / Seabed Disturbance effects

22.10.1 Several of the impacts established by the JNCC Marine Pressures-Activities Database v1.5 (REF 22.107 JNCC, 2021) have been considered under this overarching category, namely: abrasion / penetration of the substrate on the surface of the seabed;

penetration and/or disturbance of the substratum below the surface of the seabed including abrasion; changes in suspended solids (water clarity); and smothering and siltation rate changes.

22.10.2 Aspects of the English Offshore Scheme that physically disturb the seabed e.g., seabed preparation (including UXO identification and pre-sweeping of sandwaves), cable burial, cable repair, and eventual cable removal, have the potential to disturb habitats and prey species that live in contact with the seabed. Typically, the extent of this disturbance would be 15 m wide along the entire English Offshore Scheme, although where pre-sweeping of sandwaves is required, the footprint would extend to 20 m. Beyond this footprint, low intensity physical disturbance may also occur from vessel anchoring or UXO identification. The worst-case installation footprint for temporary habitat loss is presented in **Section 22.8.1** but is summarised in **Table 22-25.**

Table 22-25 - Summary of footprint for temporary habitat loss

Phase	Construction *	Operation	Decommissioning
EGL 3 Project	13.20 km^2	To be confirmed	Would be the same as the construction plus operation footprint
EGL 4 Project	12.75 km^2	To be confirmed	

* Equivalent to the footprint from the seabed clearance activity Pre-Lay Grapnel Run (PLGR), plus trial trenching and HDD exit pits. All other activities are assumed to be within these initial footprints.

22.10.3 Most Project activities that penetrate the seabed would present a temporary impact i.e., would only be undertaken once and the seabed would be able to recover after the activity. Some activities will occur in the same footprint and will be separated by several months e.g., PLGR followed by trenching. Certain habitats and species may be more sensitive to the impact than others due to their ability to recover.

22.10.4 Abrasion and penetration of the substrate could result in the localised loss of damage to sediment habitats but does not directly remove habitats or disturb the water column where cetaceans and pinnipeds spend their time. However, a change in the habitat even temporarily could lead to impacts on prey species. The footprints from this impact pathway have therefore been used to assess the significance of the impact 'changes in prey availability', rather than reach a conclusion in isolation.

22.11 Preliminary Assessment of Permanent Habitat Loss

22.11.1 This impact relates to the permanent change of one marine habitat type to another marine habitat type, through the change in substratum, including to artificial material (e.g., concrete). This involves the permanent loss of one marine habitat type but the creation of another. Associated activities include the installation of cables within the seabed (and eventual decommissioning if they remain in-situ) and the deposition of external cable protection. External cable protection would be used in the construction of infrastructure crossings and for burial remediation where full cable burial into sediment has not been achieved. Whilst most external cable protection would be installed during construction, it would also be required during the operation phase, either for the maintenance of infrastructure crossings or for remedial burial e.g., associated with a cable repair, or if the cables become exposed.

22.11.2 The worst-case installation footprint for temporary habitat loss is presented in **Section 22.8.1** but summarised is **Table 22-26**.

Table 22-26 - Summary of footprint for permanent habitat loss

Phase	Construction *	Operation	Decommissioning
EGL 3 Project	0.915 km^2	To be confirmed	No new deposits but assumes cable protection remains in place.
EGL 4 Project	1.135 km^2	To be confirmed	

* Infrastructure crossings and remedial rock protection

22.11.3 The deposition of external cable protection would result in a permanent change of habitat type within the footprint of the activity. Permanent habitat loss on the seabed does not directly remove or disturb the habitats of marine mammals. However, there may be an indirect effect on the availability of their prey species e.g., sandeel, herring. The change in substrate would make it unsuitable habitat for fish species or unsuitable for fish spawning grounds. The footprints from this impact pathway have therefore been used to assess the significance of the impact 'changes in prey availability', rather than reach a conclusion in isolation.

22.12 Preliminary assessment of Changes in prey availability

22.12.1 Marine mammals have various prey species they feed on and can travel great distances to forage. The three common species to the English Offshore Scheme (harbour porpoise, white-beaked dolphin and minke whale) are opportunistic hunters, feeding on a variety of fish (haddock, hake, cod, herring, whiting, sandeel, mackerel, salmon and flatfish), cephalopod species (squid and octopi), and crustaceans (shrimp and crabs) but herring, mackerel and sandeel are often preferred prey.

22.12.2 Activities that lead to temporary or permanent habitat loss (as outlined above) affect seabed habitats which in turn could affect the availability of prey. Disturbance of the seabed during the spawning season for species with a demersal life stage (such as sandeel and herring) could have a direct impact on the spawning biomass for a specific year group, leading to a shortage of prey species for marine mammals in subsequent years.

22.12.3 Other impacts on prey species such as underwater noise, temporary increase and deposition of suspended sediments and sediment heat changes could also combine with temporary and permanent habitat loss to lead to a change in prey availability.

22.12.4 If fish species are avoiding an area, then marine mammals potentially could travel greater distances to locate prey, leading to an energetic cost. For example, loss of a preferred prey close to a haul-out site during pupping season would increase the amount of time animals are at sea or lead to lower food availability for pup inhibiting survival. Harbour porpoises are considered to have higher metabolic rates than land mammals of a similar size and are therefore highly dependent on year-round proximity to reliable food sources (JNCC, 2019 REF 22.17). The maintenance of supporting habitats and processes to ensure the provision of prey species for marine mammals is therefore a key consideration in maintaining the favourable conservation status of the individual species.

English Offshore Scheme (excluding Southern North Sea SAC)

22.12.5 The **sensitivity** of the receptor for all marine mammal species present within the English Offshore Scheme has been assessed as **low**. Animals hunt over wider areas of the North Sea for prey species and are therefore tolerant of small-scale changes to prey availability such as that caused by localised disturbance.

22.12.6 The **magnitude** of the impact for all marine mammal species present within the English Offshore Scheme has been assessed as **low.** The worst-case footprint for temporary and permanent habitat loss as presented in **Section 22.8** and in the preliminary assessment sections above predict that 13.02 km^2 of seabed would be disturbed by the EGL 3 Project and 12.64 km^2 by the EGL 4 Project during the construction. **Volume 1, Part 3, Chapter 20: Fish and Shellfish** assessed several impacts on fish and shellfish including temporary and permanent habitat loss, temporary increases and deposition of suspended sediments, underwater noise changes, temperature increases and electromagnetic changes. The preliminary assessment concluded that the English Offshore Scheme would not have a significant adverse effect on fish and shellfish ecology. No impact on stock recruitment is predicted and therefore there is no effects predicted on the availability or distribution of prey species.

22.12.7 Intermittent and temporary behavioural impacts may be observed in a small portion of the marine mammal population if animals avoid the English Offshore Scheme during periods of high activity, but as they already use wide foraging areas survival of the individuals and reproduction rates would not be affected.

22.12.8 The assessment concluded that the **significance** of the effect was **Minor** and **Not Significant**.

Southern North Sea SAC

22.12.9 The **sensitivity** of harbour porpoise has been assessed as **Low.** Whilst harbour porpoise are highly dependant on year-round proximity to reliable food sources, the Southern North Sea SAC covers a large expanse (36,951 km^2). Harbour porpoise move freely throughout the site in their search for prey. Density data illustrated in **Volume 3, Part 3, Figure 22-4: Harbour Porpoise Density within the Southern North Sea SAC** shows that expected abundance of animals With the English Offshore Scheme is 0.6-0.7 animals per km^2 during the summer months reducing to 0.4-0.5 animals per km^2 during winter months. The English Offshore Scheme avoids the higher density areas within the SAC, located further offshore around the Dogger Bank, demonstrating that whilst harbour porpoise are present, there are other areas within the SAC (and outside i.e. offshore of Flamborough Head) which act as preferred foraging areas.

22.12.10 The **magnitude** of the impact for all marine mammal species present within the English Offshore Scheme has been assessed as Low. The EGL 3 Project crosses the Southern North Sea SAC for 49.3 km, whilst the EGL 4 Project crosses it for 47.9 km. Approximately 1.48 km^2 of the seabed would be disturbed by the EGL 3 Project and 1.50 km^2 by the EGL 4 Project. **Volume 1, Part 3, Chapter 20: Fish and Shellfish** assessed several impacts on fish and shellfish including temporary and permanent habitat loss, temporary increases and deposition of suspended sediments, underwater noise changes, temperature increases and electromagnetic changes. The preliminary assessment concluded that the English Offshore Scheme would not have a significant adverse effect on fish and shellfish ecology. No impact on stock recruitment is predicted and therefore there is no effects predicted on the availability or distribution of prey species.

22.12.11 Intermittent and temporary behavioural impacts may be observed in a small portion of the marine mammal population if animals avoid the English Offshore Scheme during periods of high activity, but as they already use wide foraging areas survival of the individuals and reproduction rates would not be affected.

22.12.12 The assessment concluded that the **significance** of the effect was **Minor** and **Not Significant.**

22.13 Preliminary assessment of Underwater Noise Changes – Geophysical Survey

22.13.1 Cetaceans and pinniped have evolved to use sound as an important aid in navigation, communication and hunting. It is generally accepted that exposure at close range to high noise levels can cause permanent or temporary hearing damage, while in extreme circumstances and at a very close range gross physical trauma is possible. At wider ranges, the introduction of any additional noise could potentially cause short term behavioural changes, for example the ability of a species to communicate and to determine the presence of predators, food, underwater features and obstructions. A change in behaviour although typically a short-term effect can have long term consequences. The animal will likely move a distance from the zone of disturbance until the activity has passed, which prevents the regular foraging, breeding and migratory patterns of the species.

22.13.2 Sound is readily transmitted into the underwater environment and there is potential for the noise emissions from construction, operation, maintenance and decommissioning of the English Offshore Scheme to affect marine mammals. The preliminary environmental assessment therefore considers the potential for lethal/physical injury, auditory injury and behavioural disturbance.

22.13.3 Noise can be categorised into impulsive sources or continuous sources. Impulsive noises are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 1986 and 2005 REF 22.108; NIOSH, 1998 REF 22.109). This category includes noise sources such as seismic surveys and underwater explosions. Continuous (non-impulsive) noises can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive noises do (ANSI, 1995 REF 22.108; NIOSH, 1998 REF 22.109). This category includes noise sources such as continuous running machinery, sonar, and vessels.

22.13.4 Underwater noise propagation modelling has been undertaken for the English Offshore Scheme to inform the Environmental Impact Assessment. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** provides a summary of acoustic concepts and terminology, acoustic assessment criteria, estimated source noise levels and provides the approach taken and results of the underwater noise propagation modelling. The report uses sound propagation models to calculate the impact ranges to marine mammals from each phase of the English Offshore Scheme for three key modelled sources:

- Geophysical surveys - non-impulsive sound sources;
- Vessels and equipment - non-impulsive sound sources; and
- Clearance of UXO - an impulsive sound source

22.13.5 The following sections provide the preliminary environmental assessment for geophysical surveys, with **Section 22.14** and **Section 22.15** providing the preliminary assessments for the other sources.

22.13.6 Marine mammals are not equally sensitive to noise at all frequencies and have different hearing sensitivity thresholds. The underwater noise propagation modelling calculates the received noise level at different distanced from the source. To determine the potential consequences of these received levels on any marine mammals, it is necessary to relate the levels to known or estimated potential impact thresholds. The injury and disturbance thresholds proposed by Southall et al., 2019 (Southall et al., 2019 REF 22.3) and NMFS, 2024 (NMFS, 2024 REF 22.1) are the latest peer reviewed criteria and have been used in this assessment. These are described and explained in **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment.** The approaches separate marine mammals into five groups based on their functional hearing i.e. the frequency characteristics (bandwidth and noise level) within which acoustic signals can be perceived and therefore are assumed to have auditory effects. The categories relevant to this assessment are:

- Low Frequency (LF) cetaceans: marine mammal species such as baleen whales (e.g. minke whale).
- High Frequency (HF) cetaceans: marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales (e.g., bottlenose dolphin and white-beaked dolphin).
- Very High Frequency (VHF) cetaceans: marine mammal species such as true porpoises, river dolphins and pygmy/dwarf sperm whales and some oceanic dolphins, generally with auditory centre frequencies above 100 kHz) (e.g., harbour porpoise).
- Phocid Carnivores in Water (PCW): true seals (e.g., harbour seal and grey seal); hearing in air is considered separately in the group Phocid Carnivores in Air (PCA).

Geophysical Survey (non-impulsive noise)

22.13.7 During construction, operation and decommissioning, several sonar-like survey types would be used e.g., multi-beam echosounder (MBES), side scan sonar (SSS), sub-bottom profiler (SBP) and USBL (ultra short baseline). These are classed as non-impulsive noise because they generally comprise a single (or multiple discrete) frequency as opposed to a broadband signal. The equipment can typically work at a range of signal frequencies, depending on the distance to the bottom and the required resolution. The signal is highly directional and acts as a beam, with the energy narrowly concentrated within a few degrees of the direction in which it is aimed. This effectively means that there is only the potential for injury if a marine mammal is directly within the main beam of the sound source. Once the animal moves outside of the main beam there is little potential for injury.

22.13.8 For geophysical survey it is best practice to follow the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from geophysical surveys (JNCC, 2017 REF 22.6). Adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Implementation of the guidance would be secured through the Construction Environmental Management Plan (see **Section 22.6**).

22.13.9 The JNCC 2017 guidelines state that MBES surveys in shallow waters (<200 m) use higher frequencies that typically fall outside the hearing frequencies of cetaceans and that the sounds produced are likely to attenuate more quickly than the lower frequencies used in deeper waters. JNCC do not, therefore, advise that mitigation is required for MBES surveys in shallow waters. SSS equipment is similar and mitigation is not required for these surveys. This preliminary environmental assessment therefore focuses on the use of SBP and USBL. It should be noted that new draft guidance was issued for consultation by JNCC in February 2025. The draft 2025 guidelines do not differ for the 2017 guidance on this point.

Injury

Cetaceans and Pinnipeds

22.13.10 Of the species present, the most sensitive to SBP are VHF cetaceans. This functional hearing category has therefore been assessed as having a **sensitivity** of **high.** This assessment is based on the potential impact ranges predicted for the VHF cetaceans. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment, Table 6-1** indicates that a permanent threshold shift (PTS) in hearing could be experienced within 195 m of the SBP, whilst a temporary threshold shift (TTS) could be experienced within 620 m of the SBP. PTS could be experienced within 70 m of the USBL with TTS occurring at 1,285 m. For context, it should be noted that the directionality of the SBP beam significantly reduces the potential for injury and temporary threshold shifts in hearing. However, it does indicate that mitigation would be required to ensure animals are not within 500 m of the SBP when the device is switched on. For other functional groups (including pinnipeds) the impact distances are <165 m.

22.13.11 The **magnitude** of the impact has been assessed as **low.** There is no direct evidence to link physical injury in cetaceans and geophysical surveys. The most likely response of a marine mammal to noise levels that could induce auditory injury is to flee from the ensonified area (Southall et al., 2007 REF 22.110). There is evidence that cetaceans exhibit short-term behavioural responses to geophysical survey e.g., Gordon et al. (Gordon et al 2003 REF 22.111), Southall et al. (Southall et al 2007 REF 22.110), Thompson et al. (Thompsom et al 2013 REF 22.112), and Sarnocińska et al. (Sarnocińska et al 2020 REF 22.113). Subsequently the onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area.

22.13.12 Therefore, the risk of auditory injury to cetaceans from use of geophysical survey and positioning equipment has been assessed as **Moderate** and **Significant without the implementation of mitigation**.

22.13.13 JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from geophysical surveys (2017) will be applied to reduce the risk of injury occurring from the SBP systems to negligible. It should be noted that new draft guidance was issued for consultation by JNCC in February 2025. This has been reviewed and any differences noted below in italics, although it should be noted that this guidance has not come into effect and may still change prior to formal publication.

22.13.14 The survey equipment and activities proposed are well within the envelope of those for which the guidelines were designed. The 2025 draft guidance state that if parametric sub-bottom profilers are used, the system is in a fixed position (e.g., hull or pole mounted and not towed), the beam width is <5˚ and no other systems are used at the

same time, then mitigation is not required. If none of the above applies then mitigation should be implemented.

22.13.15 The mitigation would include the following:

- A marine mammal observer would conduct a pre-shooting search for a minimum of 30 minutes prior to commencement of the start of SBP systems. If a marine mammal is observed within a 500 m mitigation zone around the acoustic source, survey commencement would be delayed until 20 minutes after the marine mammal has left the mitigation zone or was last observed.
- Soft-start: The JNCC guidelines require that, if possible, the operating power of the equipment will be ramped up gradually, in a uniform manner from a low-energy start-up, over a minimum period of 15 minutes. As acknowledged in the guidelines, this will not be possible with most SBP systems as they are either off or on. If a soft start can be used it would be implemented. *The draft 2025 guidance also states a maximum of 25 minutes from the start of the soft-start to the start of the survey line.*
- Line change: If line changes (or other pauses) are expected to be longer than 40 minutes, equipment operation would be stopped at the end of the survey line and the pre-shooting search would be completed prior to resuming survey at full power. Where practical, equipment operation would also be stopped or operated at a reduced power or pulse rate during line changes/pauses expected to be less than 40 minutes.
- Unplanned breaks: Where there is a gap in data acquisition of greater than 10 minutes, a pre-shooting start would be completed prior to resuming survey at full power.
- Nearshore survey lines and the offshore survey lines would start at the shore end and progress offshore to minimise risk of flushing animals towards the beach.

22.13.16 Following the JNCC et al., 2010 (JNCC 2010 REF 22.16) guidance on whether activities constitute an offence under the Habitats Regulations it can be concluded that with mitigation, the impact of noise produced by operation of equipment used during the geophysical survey is unlikely to be detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range. There is no potential for an offence to occur as a result of the proposed survey alone and therefore the assessment has concluded that the effect is **Not Significant with Mitigation**.

Southern North Sea SAC

22.13.17 The Southern North Sea SAC is designated for harbour porpoise, a VHF cetacean. Therefore, the assessment provided above is applicable with respect to injury and a conclusion of Not Significant is reached, provided mitigation is implemented. The mitigation proposed would be implemented for all SBP surveys within the SAC.

Disturbance

Cetaceans and Pinnipeds

22.13.18 For geophysical surveys, an effective deterrence range (EDR) of 5 km may be assumed based on JNCC et al., (JNCC 2020 REF 22.5). Although this EDR is provided for harbour porpoise, as the species represents the most sensitive functional hearing

group, it is used as a worst-case proxy for other species. This indicates that disturbance effects may be observed in a 5 km radius from the source. The geophysical surveys would be transient in any one location, moving in a linear nature through the English Offshore Scheme. Approximately 78.5 km^2 of sea would experience underwater noise changes sufficient to cause disturbance effects at any one time. This zone of influence would move as the survey progresses. As outlined above, there is evidence that cetaceans exhibit short-term behavioural responses to geophysical survey. However, the geophysical surveys are temporary and transient and animals are able to return to the English Offshore Scheme as soon as the vessel passes through; as evidenced by observations following a 2D seismic survey in the Moray Firth, where harbour porpoise returned to the area within 19 hours of survey stopping (BEIS, 2018 REF 22.114) Disturbance will therefore fit under the JNCC et al., (JNCC 2010 REF 22.16) classification of trivial as it will only lead to *"sporadic disturbances without any likely negative impact on the species*". The **sensitivity** of cetaceans to disturbance has been assessed as **low** and the **magnitude** of the impact has been assessed as **negligible**. The **significance** of the effect has been assessed as **Negligible** and **Not Significant.**

Southern North Sea SAC

22.13.19 Guidance from JNCC., (JNCC 2020 REF 22.5) considers noise disturbance to harbour porpoise to be significant if it results in the exclusion of harbour porpoises from more than:

- 20% of the relevant area of the site in any given day, or
- an average of 10% of the relevant area of the site over the season.

22.13.20 The English Offshore Scheme crosses both the summer and winter grounds**. Table 22-23** presents the calculated areas of the grounds that would be affected by disturbance level noise changes assuming a 5 km EDR either side of the cable routes. This is representative of one geophysical survey. The calculations indicate that the thresholds for a significant disturbance effect are not reached for either season by the Projects alone, therefore in line with the JNCC guidance it can be concluded that the potential significance of the effect is **Not Significant.** However, it should be noted that implementation of the JNCC 2017 guidance (or as superseded) would still be followed as a matter of best industry practice (as outlined in **Section 22.6**).

Table 22-2727 Calculation of disturbance effects in Southern North Sea SAC

Project	EGL 3		EGL 4	
SAC Grounds	**Summer**	**Winter**	**Summer**	**Winter**
Total area of ground (km^2)	27,028	12,696	27,028	12,696
Distance of Project within ground (km)	47.1	2.2	41.6	6.3
Total area affected by noise (km^2)	471	220	416	630
% of ground affected	1.74	0.17	1.54	0.50

22.14 Preliminary assessment of Underwater Noise Changes – Project Vessels and Equipment (non-impulsive noise)

22.14.1 Underwater noise propagation modelling has been undertaken for the English Offshore Scheme to inform the Environmental Impact Assessment. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** provides a summary of acoustic concepts and terminology, acoustic assessment criteria, estimated source noise levels and provides the approach taken and results of the underwater noise propagation modelling. Please also refer to the discussion in **Sections 22.13.1 to 22.13.6** for the background context relevant to the effects of underwater noise changes on marine mammals and information on the marine mammal functional hearing groups used in this assessment.

Injury and Disturbance

Cetaceans, Pinnipeds and Southern North Sea SAC

22.14.2 Of the species present, the most sensitive to non-impulsive noise from project vessels and equipment are very high frequency cetaceans. This assessment is based on the potential impact ranges predicted for the VHF cetaceans. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment Table 6-14** and **Table 6-15** indicate that:

- All of the equipment proposed to be used e.g. cable ploughs and trenchers, controlled flow excavator, would not cause noise levels sufficient to cause injury (PTS) to cetaceans or pinnipeds.
- TTS is only predicted within 108 m of a trailing suction hopper dredger for VHF cetaceans. All other vessels and equipment would not operate at levels or frequencies that exceed the thresholds for TTS.
- Noise levels sufficient to cause disturbance could be experienced by all species up to 2.8 km for vessels.

22.14.3 Harbour porpoise, a VHF cetacean, is the designated feature of the Southern North Sea SAC. The **sensitivity** of this species to vessel noise has been assessed as **medium,** given that the modelling has indicated that they could experience a TTS if present in close proximity to a trailing suction hopper dredger. For all other species the sensitivity has been assessed as **low**.

22.14.4 There is no direct evidence to link physical injury in cetaceans with the use of trailing suction hopper dredgers, but VHF cetaceans are likely to exhibit short-term behaviour responses if exposed to underwater noise that causes discomfort. Subsequently the

onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area.

22.14.5 There is a considerable degree of uncertainty and variability in the onset of disturbance and therefore any disturbance ranges should be treated as potentially over precautionary. Another important consideration is that vessels and construction noise would be temporary and transitory, as opposed to permanent and fixed. In this respect, construction noise is unlikely to differ significantly from vessel traffic already in the area. Animals within the Southern and Central North Sea are subject to high levels of shipping traffic and are habituated to vessel movements.

22.14.6 Disturbance will therefore fit under the JNCC et al., 2010 (JNCC 2010 REF 22.16) classification of trivial as it will only lead to "*sporadic disturbances without any likely negative impact on the species*". Based on the discussion above, the **magnitude** of the impact has been assessed as **low**.

22.14.7 The overall **significance** of the effect has been assessed as **Minor** and **Not Significant**.

22.15 Preliminary assessment of Underwater Noise Changes – UXO clearance

22.15.1 **UXO clearance is not being consented under the DCO; a separate Marine Licence would be applied for.**

22.15.2 **The below high-level assessment is provided at the request of the SNCBs for information only and to provide a holistic** overview **of all impacts associated with the English Offshore Scheme.**

22.15.3 UXO clearance is a term used to describe finding, removing and safely disposing of unexploded ordnance (e.g., bombs, shells and landmines). It follows a systematic process and mitigation hierarchy, whereby avoidance is the first option and in-situ controlled detonation of the UXO using a high-order method is the last option; only undertaken if all other options have failed or if there is an exceptional circumstance.

22.15.4 A high-order detonation is a traditional method used, whereby a donor charge is placed next to the UXO and detonated, causing a chain reaction that detonates the UXO. High order detonations are characterised by a rapid, strong shock wave.

22.15.5 Low-order clearance methods like deflagration are designed to render UXO harmless by burning out the explosive content so that the UXO does not detonate in a high-order manner. A single charge of 30 g to 80 g Net Explosive Quantity is placed proximal to the UXO. When detonated, a shaped charge penetrates the casing of the UXO to introduce a small, clinical plasma jet into the main explosive filling. The intention is to excite the explosive molecules within the main filling to generate enough pressure to burst the UXO casing, producing a deflagration of the main filling and neutralising the UXO. It is possible that some residual explosive material remains on the seabed following deflagration. In this case, recovery will be performed which may require a small (500 g) 'clearing shot'.

22.15.6 In January 2025, guidance from the UK Government was published - "Supporting minimising environmental impacts from unexploded ordnance clearance". This sets out that when applying for a marine licence if no alternatives in the UXO mitigation hierarchy exist the default method of clearance should be low noise methods in the first

instance e.g., low order detonation/deflagration as opposed to high order clearance, though high order may be considered on exception as per Department for Environment, Food and Rural Affairs guidance.

22.15.7 The precise details and locations of potential UXOs is unknown at this time. A UXO survey and identification campaign would be completed as part of the seabed preparation works during pre-construction activities. Any confirmed UXO will be marked and the below UXO mitigation hierarchy would be followed.

- Avoid the UXO by micro-routeing the cables a safe distance away
- Safely remove UXO to an alternative seabed position
- Safely remove UXO to surface for onshore disposal
- Disposal of in-situ using low order method
- Disposal of in-situ using high order method

22.15.8 High order detonation would only be considered if the low order method was not suitable for the UXO or it had failed after a minimum of three attempts and there is prior agreement with the Marine Management Organisation.

22.15.9 For the purposes of this assessment, it has been assumed that the worst case UXO size will be 697 kg (Net Explosive Quantity, NEQ), with the more realistic size charge requiring clearance of 295 kg. 697 kg represents the largest charge known to have been historically used in the study area.

22.15.10 Underwater noise propagation modelling has been undertaken for various scenarios to establish predict injury and disturbance ranges for marine mammals. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** presents the approach, results and predicted injury and disturbance ranges for the following scenarios:

- Low order disposal using a 80 g charge
- Clearing shot using a 500 g charge
- High order disposal of a 295 kg UXO
- High order disposal of a 697 kg UXO

Low order disposal

Cetaceans, Pinnipeds and Southern North Sea SAC

22.15.11 All species present are **sensitive** to underwater explosions and therefore the sensitivity has been assessed as **high**. Harbour porpoise, the designated feature of the Southern North Sea SAC, is a VHF cetacean, and therefore one of the most sensitive species to underwater noise changes.

22.15.12 For low order disposal (80 g charge), the greatest PTS range occurs for VHF cetaceans at 685 m according to Southall et al., 2019 criteria (Southall et al., 2019 REF 22.3). An impact range for behavioural disturbance of 2,455 m has been predicted for multiple detonations in a 24-hour period or 1,480 m for a single clearance, for VHF cetaceans according to the NMFS 2024 criteria (REF 22.1 NFMS 2024).

22.15.13 For the use of a clearing shot (500g), the greatest PTS range occurs for VHF cetaceans at 1,265 m according to Southall et al., 2019 criteria (Southall et al., 2019 REF 22.3). An impact range for behavioural disturbance of 3,735 m has been predicted for multiple

detonations in a 24-hour period or 2,475 m for a single clearance, for VHF cetaceans according to the NMFS 2024 criteria (NFMS 2024 REF 22.1), but noting that the disturbance range is higher at 4,010 m for multiple detonations in a 24-hr period of low frequency cetaceans.

22.15.14 The modelling indicates that even with low order disposal (considered to be the mitigated approach) there is still a relatively large release of impulsive sound. At close range there would be risk of mortality as relatively small quantities of explosive can result in significant sound pressure levels. The **magnitude** of the impact has therefore been assessed as **high** because injury is still possible with low-order disposal without additional mitigation.

22.15.15 The assessment concluded that the potential effect is Major and **Significant without additional mitigation**.

22.15.16 Mitigation would need to be agreed with JNCC/NE once the details of the UXO is known, but in accordance with the "*JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment*" (JNCC 2025 REF 22.7) would likely include some or all of the following:

- An agreed Marine Mammal Mitigation Plan would be in place for the activity.
- Works would only take place during day light hours with visibility greater than 1 nautical mile.
- Pre-clearance searches (at least 60 minutes in length) would be carried using at least two dedicated marine mammal observers and passive acoustic monitoring to ensure the mitigation zone is clear of marine mammals before clearance commences. The mitigation zone would be agreed with the Marine Management Organisation but would be a minimum of 1 km radii.
- The use of a noise abatement system (such as bubble curtains) would be discussed with the Marine Management Organisation and JNCC/NE. The effectiveness of bubble curtains often depends on the water depth and current speed and may not always be appropriate. In addition, they may not be required if the size of the charge is lower than has been modelled.
- The use of acoustic deterrent devices would be considered if the mitigation zone is greater than 1 km.
- A Wildlife Licence would be applied for in addition to the Marine Licence.
- Timing restrictions e.g., restricting clearance work to one disposal per day, restricting disposal activity to a particular day, week, month or season. This is particularly pertinent to disposal activity within the Southern North Sea SAC where there is the potential for cumulative effects with other marine developments.

22.15.17 Following the JNCC et al., (JNCC 201 REF 22.16) guidance on whether activities constitute an offence under the Habitats Regulations it can be concluded that with mitigation, the impact of noise produced by UXO low order disposal will not be detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range. The implementation of mitigation reduces both the sensitivity of the animals present and the magnitude of the impact.

22.15.18 Using the impact range of 2,455 m for behavioural responses in VHF cetaceans and area of 18.93 km^2 would be affected within the Southern North Sea SAC for each low-order disposal. This represents 0.07% of the summer grounds and 0.15% of the winter

grounds. According to the guidance from JNCC, (2020) these values are below the thresholds for significant noise disturbance**.**

22.15.19 The assessment has concluded that for low order disposal the effect is **Not Significant with Mitigation**.

High order disposal

Cetaceans, Pinnipeds, Southern North Sea SAC

22.15.20 Whilst high order disposal would only be considered in exception circumstances and assessment has been provided at the request of the SNCBs.

22.15.21 All species present are sensitive to underwater explosions and therefore the **sensitivity** has been assessed as **high**.

22.15.22 For high order disposal PTS occurs for VHF cetaceans at 10.57 km (295 kg charge) and 14.08 km (697 kg charge) according to Southall *et al.*, (Southall et al., 2019 REF 22.3) criteria. An impact range for behavioural disturbance of 10 km - 64 km has been predicted for multiple disposals in a 24-hour period (depending on the functional hearing group and the charge size) or 25.9 km for a single clearance of a 697 kg charge, for VHF cetaceans according to the NMFS (NFMS 2024 REF 22.1) criteria. It should be noted that the impact range for behavioural disturbance for LF cetaceans at 47 km (295 kg charge) and 64 km (697 kg charge) are thought to be highly precautionary. The **magnitude** of the impact has therefore been assessed as **high** as injurious effects could occur over wide areas without appropriate mitigation.

22.15.23 For high order clearance, an effective deterrence range (EDR) of 25 km may be assumed based on JNCC et al. (JNCC 2020 REF 22.5). This is in line with predicted impact ranges for VHF cetaceans for a single clearance. Using the EDR an area of 1963.5 km^2 would be affected within the SAC. This represents 7.26% of the summer grounds and 15.5% of the winter grounds. According to the guidance from JNCC, (JNCC 2020 REF 22.5) the value for the summer ground is below the thresholds for significant noise disturbance. However, the value for the winter ground is above the Threshold and would be considered Significant disturbance.

22.15.24 The assessment concluded that the potential effect is Major and **Significant without Mitigation**.

22.15.25 As discussed above, high order disposal would not occur without appropriate mitigation. Activities would be conducted in accordance with JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment (2025). Mitigation would need to be agreed with JNCC/NE once the details of the UXO is known but would likely include some or all of the points listed under mitigation for low order disposal. In addition, temporal restrictions would also be considered to ensure densities of animals are as low as possible, especially in relation to disposal activities within the Southern North Sea SAC. Even with mitigation in place it is still possible that the use of high order disposal would have a potential Significant effect.

22.16 Preliminary assessment of Collision with Project Vessels

22.16.1 Vessels would be used throughout the lifecycle of the English Offshore Scheme. The greatest requirements would be during construction and decommissioning when

multiple vessels may be working within the draft Order Limits at any one time. During operation, the use of vessels would be reduced significantly to periodic inspection surveys, sporadic maintenance or repair works on an 'as needed' basis.

22.16.2 Although shipping collision is a recognised cause of marine mammal mortality worldwide, the key factor influencing the injury or mortality caused by collisions is ship size and speed. (Laist et al., 2001 REF 22.115) stated that the most severe injuries occur when vessels are travelling at over 14 knots. As outlined in **Table 22-16,** the Applicant has committed to ensuring that all vessels (exceeding 20m) shall not exceed 14 knots during operations within the English Offshore Scheme to protect marine mammals from ship strikes. This environmental measure would be secured through the Construction Environmental Management Plan.

22.16.3 Marine mammal species are well equipped to move away from oncoming vessels before a collision, although avoidance behaviour around vessels depends on the species. Minke whale and white beaked dolphin are more accustomed to vessel noise, so may not immediately change behaviour to move away. A socialising white beaked dolphin is known to approach vessels, though if foraging or resting it will ignore them. Richardson et al (Richardson, 2005 REF 22.116) has reported curious behaviours in harbour seals, as they are avoidant when vessels are within 100 m of a haul out but regularly swim up to tourist boats.

22.16.4 During all project phases, the **sensitivity** of the receptor has been assessed as **medium**. Although vessel collisions often lead to mortality in marine mammals (Pace *et al.*, 2006 REF 22.117), and it is likely that deaths from collisions are underreported (David, 2006 REF 22.118), there have been reports of non-lethal collisions of large whales by Van Waerbeek *et al.*, (Van Waerbeek et al., 2007 REF 22.119). There is already a high level of shipping activity in the region where marine mammal densities are the highest. For example, grey and harbour seal densities are elevated (in comparison to further offshore) close to the coastline around the Humber Estuary Approaches. This area is the main approach channel for the Humber Ports, with shipping density averaging between 10 and 26 hours per km^2. Animals are therefore habituated to shipping movements. Additionally, project vessels would be slow moving, typically less than 5 knots and animals will be able to take avoidance action.

22.16.5 The **magnitude** of the impact has been assessed as **low**. Avoidance behaviour may be exhibited by a small number of individuals, but due to the temporary and transient nature of the Project vessels, the risk of collision is very low, and the survival rates and reproduction rates for the various cetacean and pinniped populations will not be impacted.

22.16.6 Overall, for all phases, the **significance** of the effect has been assessed as **Minor** and **Not Significant.**

22.17 Transboundary Effects

22.17.1 The EIA Regulations require an ES to consider the transboundary effects of a development (paragraph 5 of Schedule 4). Given the nature of the English Onshore Scheme and its proposed location, significant transboundary effects are unlikely as there are no pathways for effects to occur outside of the UK. Similarly, the English Offshore Scheme lies wholly in UK waters. Separate applications will be submitted to the relevant Statutory Authority for the Scottish Schemes. Where the English and Scottish Schemes meet, collaborative Environmental Impact Assessments will ensure impacts are fully assessed. As outlined in the Planning Inspectorate's Advice Note

Twelve the screening process for transboundary effects will be carried out by the Planning Inspectorate. Information to inform this screening assessment will be provided as part of the application for the DCO.

22.17.2 The Zone of Influence for the English Offshore Scheme would not extend outside of UK waters. However, as a highly mobile species, marine mammals are not limited by jurisdictional boundaries and may be travel into the Zone of Influence. This has been considered by the preliminary assessments presented above. The potential for likely significant effects on features of transboundary European sites has been considered in **EGL 3 and EGL 4 Draft HRA Report (May 2025) (document reference EGL-WSP-CONS-XX-RP-Y-001)**. No transboundary impacts are predicted for marine mammals.

22.18 Further work to be undertaken

22.18.1 The information provided in this PEIR is preliminary, the final assessment of significant effects will be reported in the ES. This section describes the further work to be undertaken to support the marine mammal assessment presented in the ES.

Baseline

22.18.2 An extensive programme of marine characterisation surveys has been undertaken for the English Offshore Scheme as outlined in **Volume 1, Part 3, Chapter 19: Intertidal and Subtidal Benthic Ecology**. Survey reports were being issued by the survey contractor as the Preliminary Environmental Assessment was nearing completion. Whilst efforts have been made to include initial survey findings, further work will be undertaken for the ES to ensure all survey results and analyses are incorporated and cross referenced. The data from these surveys will be used to update the baseline and assessment presented in **Volume 1, Part 3, Chapter: 19 Intertidal and Subtidal Benthic Ecology** and **Volume 1, Part 3, Chapter 20 Fish and Shellfish** . These assessments influence the marine mammal assessment for changes in prey availability.

Assessment

22.18.3 The assessments undertaken for this PEIR will be reviewed following stakeholder consultation feedback, further design refinement and review of the final reports from the English Offshore Scheme marine characterisation surveys. The following assessments will then be updated if necessary:

- Permanent habitat loss;
- Changes in prey availability;
- Cumulative effects assessment.

22.18.4 With respect to the temporary quay, if the option is taken forward, further information would be gathered in respect to whether marine mammals use the tidal river. Assessment would be included in either this Chapter or **Volume 1, Part 2, Chapter 6: Biodiversity** of the ES, if necessary.

Further environmental measures

22.18.5 Further consultation with relevant statutory consultees would be undertaken to define the scope and extents of the environmental measures set out in the assessment above. If, following stakeholder consultation feedback, further design refinement and further assessment, it is identified that additional measures are required, these will be detailed as part of the ES. An outline Marine Mammal Mitigation Protocol will also be developed to accompany the final ES.

Bibliography

REF 22.1 NMFS 2024: 2024 Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0). NOAA Technical Memorandum NMFS-OPR-71. Available at: 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0)

REF 22.2 Southall et al (2021) Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioural Responses to Human Noise. Available at: (PDF) Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioral Responses to Human Noise [Accessed January 2025]

REF 22.3 Southall et al 2019: B.L., Finneran, J,J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R, Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L. (2019) “Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects.” Aquatic Mammals. Available at: Southall-et-al_2019_MM-Noise-critieria-update-with-errata_Aq-Mammals.pdf (sea-inc.net)

REF 22.4 NOAA 2018, National Marine Fisheries Service (2018) 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

REF 22.5 JNCC, Natural England, DAERA (2020), Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs, June 2020, Available at: SACNoiseGuidanceJune2020.pdf

REF 22.6 JNCC (2017) JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys . Available at: JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys [Accessed January 2025]

REF 22.7 JNCC, January 2025, Available at: JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment

REF 22.8 Gov.UK 2025, 3.1.1, Injury to Marine mammals, available at: Supporting minimising environmental impacts from unexploded ordnance clearance - GOV.UK

REF 22.9 IAMMWG. 2023. Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091. https://hub.jncc.gov.uk/assets/b48b8332-349f-4358-b080-b4506384f4f7

REF 22.10 Carter et al 2022, Sea Mammal Research Unit (SMRU) and Marine Scotland. 2017. Estimated at-sea Distribution of Grey and Harbour Seals - updated maps 2023. doi: 10.7489/2029-1. OGL

Carter, M.I.D., Boehme, L., Cronin, M.A., Duck, C.D., Grecian, W.J., Hastie, G.D. et al., (2022). Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management. Frontiers in Marine Science, 9

REF 22.11 SCOS (2022) Scientific Advice on Matters Related to the Management of Seal Populations: 2022. Available at: http://www.smru.st-andrews.ac.uk/files/2023/09/SCOS-2022.pdf

REF 22.12 NatureScot (2023) Guidance Notes: Guidance to support Offshore Wind Applications: Marine Ornithology. https://www.nature.scot/professional-advice/planning-and-development/planning-anddevelopment-advice/renewable-energy/marine-renewables/advice-marine-renewables-development. (Accessed March 2023.)

REF 22.13 JNCC (2017), Esther L. Jones, Sophie Smout, Deborah J. F. Russell, Eunice H. Pinn & Bernie J. McConnell, Review of analytical approaches for identifying usage and foraging areas at sea for harbour seals, January 2017, available at: Review of analytical approaches for identifying usage and foraging areas at sea for harbour seals

REF 22.14 OAP (2022) Seal Abundance and Distribution. Available at https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/marine-mammals/seal-abundance-and-distribution/

REF 22.15 NPWS 2015, National Parks & Wildlife Service, Otter (Lutra lutra), Available at: Mammals | National Parks & Wildlife Service

REF 22.16 JNCC 2010, Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise, August 2010, Available at: Statutory nature conservation agency protocol for minimising the ris of injury to marine mammals from piling noise

REF 22.17 JNCC (2019) Harbour Porpoise (Phocoena phocoena) Special Area of Conservation: Southern North Sea Conservation Objectives and Advice on Operations . Available at: Southern North Sea MPA: Conservation Objectives And Advice On Operations (jncc.gov.uk)

REF 22.18 NatureScot 2024, Conservation and Management Advice, SOUTHERN TRENCH MPA, September 2024, Available at: Conservation and Management Advice - Southern Trench

REF 22.19 BISE, 2008, Klaverbank Netherlands Natura 2000 site, Habitats Directive. Available at: Site | Biodiversity Information System for Europe

REF 22.20 BISE, 2008, Doggersbank Netherlands Natura 2000 site Habitats Directive. Available at: Site | Biodiversity Information System for Europe

REF 22.21 BISE 2009 , Vlaamse banken, site established 1900, Natura 2000 site Birds and Habitats Directive. Available at: Site | Biodiversity Information System for Europe

REF 22.22 BISE, 2004, Doggerbank, Germany Natura 2000 site, Habitats Directive. Available at: Site | Biodiversity Information System for Europe

REF 22.23 BISE 2016, Bancs des Flandres, France, available at: Site | Biodiversity Information System for Europe

REF 22.24 ICES 2016, Greater North Sea Ecoregion, Ecosystem components: marine mammals, Available at: Greater North Sea Marine mammals

REF 22.25 Hammond et al 2004, Monitoring cetaceans in European waters, PETER G. H. EVANS and PHILIP S. HAMMOND, Mammal Rev. 2004, Volume 34, No. 1, 131–156. Printed in Great Britain, Available at: mam_27.fm

REF 22.26 Reid, J.B., Evans, P.G.H. & Northridge, S.P. 2003. Atlas of Cetacean distribution in north-west European waters, JNCC, Peterborough, ISBN 1 86107 550 2.

REF 22.27 Gilles, A, Authier, M, Ramirez-Martinez, NC, Araújo, H, Blanchard, A, Carlström, J, Eira, C, Dorémus, G, FernándezMaldonado, C, Geelhoed, SCV, Kyhn, L, Laran, S, Nachtsheim, D, Panigada, S, Pigeault, R, Sequeira, M, Sveegaard, S, Taylor, NL, Owen, K, Saavedra, C, Vázquez-Bonales, JA, Unger, B, Hammond, PS (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64 pp. https://tinyurl.com/3ynt6swa

REF 22.28 JNCC (2015) A Conservation Literature Review for the Harbour Porpoise (Phocoena phocoena), JNCC Report No: 566, December 2015, IAMMWG, Camphuysen, C.J. & Siemensma, M.L, Available at: A Conservation Literature Review for the Harbour Porpoise (Phocoena phocoena)

REF 22.29 Kastelein, R.A., Hardman, J. and Boer, H. (1997). Food consumption and body weight of harbour porpoises (*Phocoena phocoena*). In: The Biology of the Harbour Porpoise (Read, A.J., Wiepkema, P.R. and Nachtigall, P.E. Eds.). De Spil Publishers, pp. 217-233.

REF 22.30 Lockyer, C.H., Desportes, G., Hansen, K., Labberté, S. and Siebert, U. (2003). Monitoring growth and energy utilisation of the harbour porpoise (*Phocoena phocoena*) in human care. NAMMCO Scientific Publications 5, 107-120.

REF 22.31 Wisniewska, (2016). Wisniewska, DM, Johnson, M, Teilmann, J, Rojano-Doñate, L, Shearer, J, Sveegaard, S et al. (2016). Ultra-high foraging rates of harbour porpoises make them vulnerable to anthropogenic disturbance. Current Biology 26, 1441–1446. doi: 10.1016/j.cub.2016.03.069

REF 22.32 Mahfouz, C., Meziane, T., Henry, F., Abi-Ghanem, C., Spitz, J., Jauniaux, T., Bouveroux, T., Khalaf, G. and Amara, R. (2017). Multi-approach analysis to assess diet of harbour porpoises *Phocoena phocoena* in the southern North Sea. *Marine Ecology Progress Series*, 563: 249-259.

REF 22.33 Santos, M.B., Pierce, G.J., Learmouth, J.A., Reid, R.J., Ross, H.M., Patterson, I.A.P., Reid, D.G. and Beare, D. (2004). Variability in the diet of harbor porpoises (*Phocoena phocoena*) in Scottish waters 1992-2003. *Marine Mammal Science*, 20(1): 1-27

REF 22.34 Robinson et al 2007, The summer distribution and occurrence of cetaceans in the coastal waters of the outer southern Moray Firth in northeast Scotland (UK), Kevin P. Robinson, Nina Baumgartner, Sonja M. Eisfeld, Nicola M. Clark, Ross M. Culloch, Gary N. Haskins, Livia Zapponi, Allan R. Whaley, Joanne S. Weare & Michael J. Tetley, Cetacean Research & Rescue Unit (CRRU), P.O. Box 11307, Banff, AB45 3WB, Scotland, UK, Available at: Lutra 50(1)_Robinson et al_2007.pdf

REF 22.35 Jennifer A Learmonth, Sinead Murphy, Patricia Lastra Luque, Robert Jospeh Reid, Life history of harbor porpoises (Phocoena phocoena) in Scottish (UK) waters, April 2014 Marine Mammal Science, Available at: (PDF) Life history of harbor porpoises (Phocoena phocoena) in Scottish (UK) waters

REF 22.36 Weir, C.R., Stockin, K.A. and Pierce, G.J. (2007). Spatial and temporal trends in the distribution of harbour porpoises, white-beaked dolphins and minke whales off Aberdeenshire (UK), north-western North Sea. *Journal of the Marine Biological Association of the United Kingdom*, 87: 327-338.

REF 22.37 Heinänen, S. and Skov, H. (2015). The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area. JNCC Report No. 544. JNCC, Peterborough.

REF 22.38 Isojunno, S., Matthiopoulos, J. and Evans, P.G.H. (2012). Harbour porpoise habitat preferences: robust spatio-temporal inferences from opportunistic data. Marine Ecology Progress Series, 448: 155-170.

REF22.39 Booth, C.G., Embling, C., Gordon, J., Calderan, S.V. and Hammond, P.S. (2013). Habitat preferences and distribution of harbour porpoise (Phocoena phocoena) west of Scotland. Marine Ecology Progress Series, 478: 273-285.

REF 22.40 Seawatch Foundation Sightings, 2024. Available at: https://www.seawatchfoundation.org.uk/recentsightings/

REF 22.41 NBN (2023), NBN ATLAS 2023, Available at: https://nbnatlas.org/?gclid=EAIaIQobChMI9_-9je-siwMVmpJoCR1dMzcHEAAYASAAEgJMT_D_BwE

REF 22.42 Atkins 2016, Kidcardine Offshore wind farm environmental statement https://marine.gov.scot/data/kincardine-offshore-windfarm-environmental-statement-and-appendices

REF 22.43 Seagreen 2018 EIA Report Chapter 10 Marine Mammals https://marine.gov.scot/sites/default/files/chapter_10_marine_mammals.pdf

REF 22.44 JNCC (2023) Southern North Sea MPA. Available at: https://jncc.gov.uk/our-work/southern-north-sea-mpa/#:~:text=The%20Southern%20North%20Sea%20SAC%20lies%20along%20the%20east%20coast,of%20harbour%20porpoise%20Phocoena%20phocoena

REF 22.45 JNCC. (2019a). *Article 17 Habitats Directive Report 2019: Species Conservation Status Assessments 2019. Conservation status assessment for the species: S1351 - Harbour porpoise (Phocoena phocoena).*

REF 22.46 Hammond P.S., Lacey C., Gilles A., Viquerat S., Börjesson P., Herr H., Macleod K., Ridoux V., Santos M.B., Scheidat M., Teilmann J., Vingada J., Øien N. (2021) Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Available at: Microsoft Word - SCANS-III design-based estimates 2021-05-26 (st-andrews.ac.uk)

REF 22.47 Gilles, A., Viquerat, S., Becker, A., Forney, K.A., Geelhoed, C.V., Haelters, J., Nabe-Nielsen, J., Scheidat, M., Siebert, U., Sveegaard, S., van Beest, F.M., van Bemmelen, R. and Aarts, G. (2016). Seasonal habitat-based density models for a marine top predator, the harbor porpoise, in a dynamic environment. Ecosphere, 7(6): e01367.

REF 22.48 Gilles, A., Scheidat, M. and Siebert, U. (2009). Seasonal distribution of harbour porpoise and possible interference of offshore wind farms in the German North Sea. Marine Ecology Progress Series, 383: 295-307.

REF 22.49 Cucknell, A.C., Boisseau, O., Leaper, R., McLanaghan, M. and Moscrop, A. (2017). Harbour porpoise (Phocoena phocoena) presence, abundance and distribution over the Dogger Bank, North Sea, in winter. Journal of the Marine Biological Association of the United Kingdom, 97(7): 1455-1465.

REF 22.50 Waggitt, J.J., Evans, P.G.H., Andrade, J., Banks, A.N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C.J., Durinck, H., Felce, T., Fijn, R.C., Garcia-Baron, I., Garthe, S., Geelhoed, S.C.V., Gilles, A., Goodall, M., Haelters, J., Hamilton, S., Hartny-Mills, L., Hodgins, N., James, K., Jessopp, M., Kavangh, A.S., Leopold, M., Lohrengel, K., Louzao, M., Markones, N., Martínez-Cedeira, J., Cadhla, O.Ó., Perry, S.L., Pierce, G.J., Ridoux, V., Robinson, K.P., Santos, B.M., Saavedra, C., Skov, H., Stienen, E.W.M., Sveegaard, S., Thompson, P., Vanermen, N., Wall, D., Webb, A., Wilson, J., Wanless, S. and Geert Hiddink, J. (2020). Distribution maps of cetacean and seabird populations in the North-East Atlantic. *Journal of Applied Ecology*, 57(2): 203-446.

REF 22.51 Canning et al 2008, Canning SJ, Santos MB, Reid RJ, et al. Seasonal distribution of white-beaked dolphins (Lagenorhynchus albirostris) in UK waters with new information on diet and habitat use. *Journal of the Marine Biological Association of the United Kingdom*. 2008;88(6):1159-1166. doi:10.1017/S0025315408000076

REF 22.52 Brereton et al 2016, Photo-identification Analysis of White-beaked Dolphins off South west and North east England 2007-2014, Tom Brereton, Martin Kitching, Rachel Davies Fiona McNie & Rebecca Walker, Natural England, Available at: https://publications.naturalengland.org.uk/publication/5149990171705344

REF 22.53 Howes, C. (2004). Whale, dolphin and porpoise records from the Yorkshire and Humber region 1998-2010. Yorkshire Naturalists Union Mammals & Lower Vertebrates Section. Downloaded on 27 April 2023 from https://www.ynu.org.uk/recording-sections/sections/mammals/mammal-links-and-downloads

REF 22.54 JNCC 2023 Minke Whale, Review of Management Unit boundaries for cetaceans in UK waters (2023), JNCC Report 734, Available at: JNCC Report 734: Review of Management Unit boundaries for cetaceans in UK waters (2023)

REF 22.55 Risch, D., Castellote, M., Clark, C.W., Davis, G.E., Dugan, P.J., Hodge, L.E.W., Kumar, A., Lucke, K., Mellinger, D.K., Nieukirk, S.L., Popescu, C.M., Ramp, C., Read, A.J., Rice, A.N., Silva, M.A., Siebert, U., Stafford, K.M., Verdaat, H. and Van Parijs, S.M. (2014).

Seasonal migrations of North Atlantic minke whales: novel insights from large-scale passive acoustic monitoring networks. *Movement Ecology*, 2: 24.

REF 22.56 Black and Cunningham 2019, Scottish MPA Programme Data confidence assessment SOUTHERN TRENCH POSSIBLE MPA JUNE 2019, Available at: Southern Trench possible MPA - Data Confidence Assessment.pdf

REF 22.57 Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E. and Thomas L. (2016). *Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource*. JNCC Report No.517

REF 22.58 NatureScot 2024, Bottlenose Dolphin, Available at: Bottlenose dolphin | NatureScot

REF 22.59 Hackett, K. (2022). Movement and ecology of bottlenose dolphins (Tursiops truncutus) along the North-East coast of the UK. A dissertation submitted in partial fulfilment of the requirements for the degree of Master of Science (MSc) in Marine Biology. Bangor University, Gwynedd, UK.

REF 22.60 Aynsley, C. (2017). Bottlenose dolphins (Tursiops trunactus) in north-east England: A preliminary investigation into a population beyond the southern extreme of its range. MSc Thesis, Newcastle University, Newcastle UK.

REF 22.61 Arso Civil, M., Quick, N., Mews, S., Hague, E. Cheney, B.J., Thompson, P.M. and Hammond, P.S. (2021). Improving understanding of bottlenose dolphin movements along the east coast of Scotland. Final report. Report number SMRUC-VAT-2020-10 provided to European Offshore Wind Deployment Centre (EOWDC), March 2021 (unpublished).

REF 22.62 Wilson, B., Reid, R.J., Grellier, K., Thompson, P.M. and Hammond, P.S. (2004). Considering the temporal when managing the spatial: a population range expansion impacts protected areas-based management for bottlenose dolphins. Animal Conservation, 7: 331-338

REF 22.63 Arso Civil, M., Quick, N. J., Cheney, B., Pirotta, E., Thompson, P. M. and Hammond, P. S. (2019). *Changing distribution of the east coast of Scotland bottlenose dolphin population and the challenges of area-based management.* Aquatic Conservation: Marine and Freshwater Ecosystems, 29(S1), 178–196. Available at: https://doi.org/10.1002/aqc.3102

REF 22.64 MarLIN 2022, Short-beaked common dolphin (*Delphinus delphis*), Available at: Short-beaked common dolphin (Delphinus delphis) - MarLIN - The Marine Life Information Network

REF 22.65 Kessler 2021, Stomach contents of common dolphins (Delphinus delphis) and striped dolphins (Stenella coeruleoalba) in Scottish waters between 1992 and 2011, CSIC, Available at: Report Lucie Kessler

REF 22.66 Murphy, S., Pinn, E.H. and Jepson, P.D. (2013). The short-beaked common dolphin (Delphinus delphis) in the North-East Atlantic: Distribution, ecology, management and conservation status. Oceanography and Marine Biology: An Annual Review, 51: 193-280.

REF 22.67 Neumann, D.R. (2001). Seasonal movements of short-beaked common dolphins (*Delphinus delphis*) in the north-western Bay of Plenty, New Zealand: Influence of sea surface temperature and El Niño/La Niña. *New Zealand Journal of Marine and Freshwater Research*, 35(2): 371-374.

REF 22.68 MacLeod C.D., Weir C.R., Santos M.B. and Dunn T.E. (2008) Temperature-based summer habitat partitioning between white-beaked and common dolphins around the United Kingdom and Republic of Ireland. Journal of the Marine Biological Association of the United Kingdom 88, 1193– 1198

REF 22.69 Stevick, Peter & Allen, Judith & Clapham, PJ & Friday, N & Katona, Steven & Larsen, F. & Lien, J & Mattila, David & Palsbøll, Per & Sigurjónsson, Jóhann & Smith, Tim & Øien, Nils. (2003) North Atlantic humpback whale abundance and rate of increase four decades after protection from whaling. Available at: https://www.researchgate.net/publication/250217977_North_Atlantic_humpback_whale_abundance_and_rate_of_increase_four_decades_after_protection_from_whaling

REF 22.70 MarLIN (2008) Humpback Whale. Available at: https://www.marlin.ac.uk/species/detail/106

REF 22.71 B.J. Mcconnell, M.A. Fedak, P. Lovell, P.S. Hammond, Movements and foraging areas of grey seals in the North Sea, Journal of Applied Ecology Volume 36, Issue 4, 25 December 2001, Available at: https://doi.org/10.1046/j.1365-2664.1999.00429.x

REF 22.72 Linsay J. Wilson, Philip S.Hammond, The diet of harbour and grey seals around Britain: Examining the role of prey as a potential cause of harbour seal declines, Aquatic Conservation: Marine and Freshwater Ecosystems / Volume 29, Issue S1 p.71-85, Available at: Aquatic Conservation: Marine and Freshwater Ecosystems | Aquatic Journal | Wiley Online Library

REF 22.73 JNCC (2022) 1364 Grey seal. Available at: https://sac.jncc.gov.uk/species/S1364/

REF 22.74 SCOS. 2021. Scientific Advice on Matters Related to the Management of Seal Populations: (2021). Natural Environment Research Council Special Committee on Seals. Downloaded on 14 April 2023 from http://www.smru.st-andrews.ac.uk/scos/

REF 22.75 SMRU 2014, Scientific Advice on Matters Related to the Management of Seal Populations: 2014, Available at: Microsoft Word - SCOS Advice 2014.docx

REF 22.76 Natural England (2014) Citation for Special Area of Conservation (SAC) Humber Estuary. Available at: http://publications.naturalengland.org.uk/publication/5009545743040512

REF 22.77 Humber Nature Partnership 2023, Protected species and habitats as part of the Humber Estuary European Marine Site designations, Available at: Habitats and Species on the Humber

REF 22.78 JNCC (2023a) Berwickshire and North Northumberland Coast. Available at: https://sac.jncc.gov.uk/site/UK0017072

REF 22.79 JNCC (2022a) 1365 Harbour Seal. Available at: https://sac.jncc.gov.uk/species/S1365/

REF 22.80 Sharples, R.J., Moss, S.E., Patterson, T.A. and Hammond, P.S. (2012). Spatial variation in foraging behaviour of a marine top predator (Phoca vitulina) determined by a large scale satellite tagging program. PLoS One, 7(5): e37216.

REF 22.81 Morris, C.D., Duck, C.D.,and Thompson, D. 2021. Aerial surveys of seals in Scotland during the harbour seal moult, 2016-2019. NatureScot Research Report 1256.

REF 22.82 Cunningham, L., Baxter, J.M., Boyd, I.L., Duck, C.D., Lonergan, M., Moss, S.E. and McConnell, B. 2009. Harbour seal movements and haul-out patterns: implications for monitoring and management. Aquatic Conservation: Marine and Freshwater Ecosystems, 19(4): 398-407.

REF 22.83: Jones, E. L., McConnell, B. J., Smout, S. C., Hammond, P. S., Duck, C. D., Morris, C., Thompson, D., Russell, D. J. F., Vincent, C., Cronin, M., Sharples, R. J. and Matthiopoulos, J. 2015. Patterns of space use in sympatric marine colonial 6 predators reveals scales of spatial partitioning. Marine Ecology Progress Series, 534, p. 235-249. DOI: 10.3354/meps1137

REF 22.84 Vance, H.M., Hooker, S.K., Mikkelsen, L., van Neer, A., Teilmann, J., Siebert, U. and Johnson, M. (2021). Drivers and constraints on offshore foraging in harbour seals. *Scientific Reports*, 11: 6514.

REF 22.85 Sharples et al 2021, Ruth J. Sharples, Simon E. Moss, Toby A. Patterson, Philip S. Hammond, Spatial Variation in Foraging Behaviour of a Marine Top Predator (*Phoca vitulina*) Determined by a Large-Scale Satellite Tagging Program, Available at: Spatial Variation in Foraging Behaviour of a Marine Top Predator (Phoca vitulina) Determined by a Large-Scale Satellite Tagging Program | PLOS One

REF 22.86 Thompson & Russel SCOS 2021, Scientific Advice on Matters Related to the Management of Seal Populations: 2021, Natural Environment Research Council Special Committee on Seals, Available at: SCOS-2021.pdf

REF 22.87 Bond, I. (2022). Tees Seal Research Programme. Monitoring Report No. 32 (2020-2022). Downloaded from http://www.inca.uk.com/reports/ on 3 May 2023.

REF 22.88 JNCC (2022b) Distribution of SACs/SCIs/cSACs containing species 1355 Lutra lutra. Available at: https://sac.jncc.gov.uk/species/S1355/map

REF 22.89 NBN Atlas (2023) Eurasian Otter. Available at: https://species.nbnatlas.org/species/NBNSYS0000005133

REF 22.90 Ijsseldijk, L., Brownlow, A., Davison, N., Deaville, R., Haelters, J., Keijl, G., Siebert, U. & ten Doeschate, M. 2018. Spatiotemporal trends in white-beaked dolphin strandings along the North Sea coast from 1991–2017. Lutra, 61(1), 153–163

REF 22.91 MacLeod, C.D., Weir, C.R., Santos, M.B. and Dunn, T.E. (2008). *Temperature-based summer habitat partitioning between white-beaked and common dolphins around the United Kingdom and Republic of Ireland*. Journal of the Marine Biological Association of the United Kingdom 88(6): 1193-1198.

REF 22.92 SCOS (2020) Schulte-Pelkum, N., Wieskotten, S., Hanke, W., Dehnhardt, G., and Mauck, B. (2007). *Tracking of biogenic hydrodynamic trails in harbour seals (Phoca vitulina*). Journal of Experimental Biology, 210(5), 781-787.SCOS (2020). *Scientific Advice on Matters Related to the Management of Seal Populations: 2020.* Sea Mammal Research Unit. Available at: SCOS Reports | SMRU (st-andrews.ac.uk).

REF 22.93 Robinson, K.J., Hall, A.J., Scholl, G., Debier, C., Thome, J., Eppe, G., Adam, C. and Bennet, K.A. (2019) *Investigating decadal changes in persistent organic pollutants in Scottish grey seal pups.* Aquatic Conserv: Mar Freshw Ecosyst. 29(S1): 86– 100.

REF 22.94 Northridge, S., Kingston, A. and Thomas, L. (2019). *Annual report on the implementation of Council Regulation (EC) No 812/2004 during 2018*.

REF 22.95 Santos, M.B., and Pierce, G.J. (2003). *The diet of harbour porpoise (Phocoena phocoena) in the Northeast Atlantic.* Oceanography and Marine Biology: an Annual Review 2003, 41, 355–390.

Santos, M.B., Pierce, G.J., Learmouth, J.A., Reid, R.J., Ross, H.M., Patterson, I.A.P., Reid, D.G. and Beare, D. (2004). Variability in the diet of harbor porpoises (*Phocoena phocoena*) in Scottish waters 1992-2003. *Marine Mammal Science*, 20(1): 1-27.

REF 22.96 IAMMWG. (2015). *Management Units for cetaceans in UK waters*. JNCC Report 547, ISSN 0963-8091.

REF 22.97 JNCC. (2019b). *Article 17 Habitats Directive Report 2019: Species Conservation Status Assessments 2019. Conservation status assessment for the species: S1349 - Bottlenose dolphin (Tursiops truncatus*

REF 22.98 Northridge, S., Cargill, A., and Coram, A. (2010). *Entanglement of Minke Whales in Scottish Waters; An Investigation into Occurrence, Causes and Mitigation.* Final Report to Scottish Government, CR/2007/49. St Andrews: University of St Andrews, 57

REF 22.99 Gill, A., Reid, R.J. and Fairburns, B.R. (2000). Photographic and strandings data highlighting the problem of marine debris and creel rope entanglement to minke whales (Balaenoptera acutorostrata). Eur Res Cetaceans 14:173–178.

REF 22.100 Robinson, K.J., Hall, A.J., Scholl, G., Debier, C., Thome, J., Eppe, G., Adam, C. and Bennet, K.A. (2019) *Investigating decadal changes in persistent organic pollutants in Scottish grey seal pups.* Aquatic Conserv: Mar Freshw Ecosyst. 29(S1): 86– 100.

REF 22.101 OSPAR IA (2017). *Abundance and distribution of cetaceans*. Available from: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/.

Orsted. (2021). Horsea Project Four: Environmental Statement. PINS Document Reference A5.4.1 APFP Regulation 5(2)a. Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1). Prepared by SMRU Consulting for Orsted.

REF 22.102 *JNCC (2019d) Natura 2000 – Standard data form, Southern North Sea SAC. Joint Nature Conservation*

REF 22.103 BOEMER 2011, EFFECTS OF EMFS FROM UNDERSEA POWER CABLES ON ELASMOBRANCHS AND OTHER MARINE SPECIES, Final Report, U.S. Department of the Interior Bureau of Ocean Energy Management, Regulation and Enforcement Pacific OCS Region, Available at: 2011-09-EMF-Effects.pdf

REF 22.104 Gillet et al 2005, N Gillet, L Huder, J Aubert, A reduced stochastic model of core surface dynamics based on geodynamo simulations, *Geophysical Journal International*, Volume 219, Issue 1, October 2019, Pages 522–539, Available at: reduced stochastic model of core surface dynamics based on geodynamo simulations | Geophysical Journal International | Oxford Academic

REF 22.105 Walker, W.A., M.B. Hanson, R.W. Baird and T.J. Guenther. 1998. Food habits of the harbor porpoise, Phocoena phocoena, and Dall's porpoise, Phocoenoides dalli, in the inland waters of British Columbia and Washington. Pages 63-75 in Marine Mammal Protection Act and Endangered Species Act Implementation Program 1997. AFSC Processed Report 98-10. National Marine Fisheries Service, Seattle, WA.

REF 22.106 Susan C. Wilson, Irina Trukhanova, Lilia Dmitrieva, Evgeniya Dolgova, Imogen Crawford, Mirgaliy Baimukanov, Timur Baimukanov, Bekzat Ismagambetov, Meirambek Pazylbekov, Mart Jüssi, Simon J. Goodman,

Assessment of impacts and potential mitigation for icebreaking vessels transiting pupping areas of an ice-breeding seal, Volume 214 Biological Conservation, Available at: https://doi.org/10.1016/j.biocon.2017.05.028.

REF 22.107 JNCC 2021, Marine Activities and Pressures Evidence, February 2021, Available at: Marine Activities and Pressures Evidence | JNCC - Adviser to Government on Nature Conservation

REF 22.108 ANSI 1986, Methods for Measurements Of Impulse Noise, Acoustical Society of America, 1986, Reaffirmed 1998, 2006, 2015, 2020, Available at: ANSI/ASA S12.7-1986 (R2020) - Methods for Measurements of Impulse Noise

REF 22.109 NIOSH NIOSH Criteria for a Recommended Standard: Occupational Noise Exposure, Revised Criteria 199May 2002 The Journal of the Acoustical Society of America 111(5):2397-2397 Available at: :10.1121/1.4778162

REF.22110 Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and

Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33: Number 4. [online] Available at: http://seainc.net/assets/pdf/mmnoise_aquaticmammals.pdf (Accessed Feb 2020)

REF 22.111 Gordon et al 2003, Gillespie, Douglas & Potter, John & Frantzis, Alexandros & Simmonds, Mark & Swift, René & Thompson, David. (2003). A Review of The Effects of Seismic Surveys on Marine Mammals. Marine Technology Society Journal. 37. 16-34. 10.4031/002533203787536998. A Review of The Effects of Seismic Surveys on Marine Mammals, Available at: (PDF) A Review of The Effects of Seismic Surveys on Marine Mammals

REF 22.112 Thompson et al 2013, : Thompson PM, Brookes KL, Graham IM, Barton TR, Needham K, Bradbury G, Merchant ND. 2013 Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. Proc R Soc B 280: 20132001. http://dx.doi.org/10.1098/rspb.2013.2001

REF 22.113 Sarnocinska, Joanna; Teilmann, Jonas; Balle, Jeppe et al. (2020). Harbour porpoise (Phocoena phocoena) reaction to a 3D seismic airgun survey in the North Sea [Dataset]. Dryad. https://doi.org/10.5061/dryad.7sqv9s4pg

REF 22.114 BEIS 2018, Report on expenditure and performance of the Department for Business, Energy and Industrial Strategy, 1 April 2018 to 31 March 2019. Available at: BEIS annual report and accounts 2018 to 2019 - GOV.UK

REF 22.115 Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. (2001). Collisions between ships and whales. Marine Mammal Science 17: 35-75.

REF 22.116 Richardson, W.J., Greene, C.R. Jr., Malme, C.I., and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, San Diego, CA, USA. 576p

REF 22.117 Pace, D. S., A. Miragliuolo, and B. Mussi (2006). Vessels and dolphins; scars that tell stories. Fins: 19-20

REF 22.118 David (2006). Risks of collision for fin whales in the north-western Mediterranean Sea in summer. Fins: 16-18

REF 22.119 Van Waerebeek, K., Baker, A.N., Félix, F., Gedamke, J., Iñiguez, M., Sanino, G.P., Secchi, E., Sutaria, D., van Helden, A. and Wang, Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the southern hemisphere, and initial assessment. LAJAM 6: 43-69.

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