Eastern Green Link 3 and Eastern Green Link 4

Environmental Impact Assessment Scoping Report

Volume 1 Main Text

Part 3 English Offshore Scheme

July 2024

Contents

19. Consideration of Alternatives

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19. Consideration of Alternatives

19.1 Introduction

19.1.1 This Scoping Report considers all components of EGL 3 and EGL 4 between the electricity transmission connection point in England and the Mean Low Water Spring (MLWS) in England (known as the English Onshore Scheme) and all components within the English marine environment up to the Mean High-Water Springs (MHWS) in England (known as the English Offshore Scheme). EGL 3 comprises a 2 GW HVDC system linking Peterhead in Scotland and Norfolk in England and EGL 4 comprises a 2 GW HVDC system linking Fife in Scotland and Norfolk in England. Further information about EGL 3 and EGL 4 can be found in Part 1 of this Scoping Report. Section 1.4, Part 1 outlines the terms used throughout the Scoping Report.

19.1.2 Part 3 of this Scoping Report specifically considers the English Offshore Scheme and within Part 3 any reference to the Scoping Boundary refers solely to the English Offshore Scheme. The English Offshore Scheme will be assessed within one Scoping Boundary which extends from the mean high-water spring (MHWS) line at the Landfalls to the boundary between English and Scottish waters. Separate consents will be sought for the Scottish Offshore Schemes (all components of EGL 3 and EGL 4 within the Scottish marine environment up to the MHWS in Scotland). Chapters 19 – 32 of this Scoping Report focus on the English Offshore Scheme only.

19.1.3 It is the intention of the National Grid Electricity Transmission plc (NGET) that the English Offshore Scheme is to be included in the application for development consent as Associated Development pursuant to section 105(2) of the Planning Act 2008. The Development Consent Order (DCO) will incorporate Deemed Marine Licences (DML) for the English Offshore Scheme.

19.1.4 Until June 2024 it was the NGET's intention that it would apply for separate Marine Licences under the Marine and Coastal Access Act 2009 for the Projects. Non-statutory scoping reports for the Scottish Offshore Scheme and English Offshore Schemes were submitted to the Marine Management Organisation (MMO) in January 2024 with individual Scoping Opinions for EGL 3 and EGL 4 (offshore components) received on 04 in May 2024. Following recommendations from the MMO, a change in consenting strategy was agreed in late June 2024 and the English Offshore Schemes will be included in the application for development consent. Where appropriate the non-statutory scoping comments received in May 2024 have been addressed and integrated into the relevant topic chapters of this Scoping Report. Please refer to the consultation section of each topic chapter for specific details and Volume 2, Part 3, for the formal scoping opinions.

19.1.5 The Scoping Boundary is nominally 1 km wide, 500 m either side of the centre lines for of EGL 3 and EGL 4 (within the English Offshore Scheme), however, it widens in areas where there is still optionality in the design, e.g., to allow for micro-routeing around potential seabed features. It is anticipated that the DCO boundary will ultimately be 500 m wide for the English Offshore Scheme, following refinement and rationalisation as the Environmental Impact Assessment (EIA) and design process evolves. There are two proposed Landfalls being considered at this stage of the EIA process; Anderby Creek and Theddlethorpe. These options will be subject to further technical feasibility work and stakeholder consultation and will be refined to one preferred option for further assessment as part of the EIA. In addition, at present there are two proposed offshore routes for both EGL 3 and for EGL 4 within the English Offshore Scheme. These are to provide optionality around and through the Holderness Offshore Marine Conservation Zone (MCZ). The preferred option for both EGL 3 and EGL 4 seeks to avoid or minimise interaction with the Holderness Offshore MCZ and the alternative routes cross it. The Scoping Boundary incorporates both options in this Scoping Report, however, a decision will be made and assessed as part of the ES as to which route option is taken forward. The Scoping Boundary is illustrated in Figure 19-1 (Drawing: C01494-EGL3&4-LOC-001).

19.1.6 Kilometre point (KP) markers have been used throughout the Scoping Report to identify specific locations along the centreline of the Scoping Boundary. KPs have been generated along the preferred offshore route from the proposed Landfall at Anderby Creek, around the Holderness Offshore MCZ to the territorial boundary between England and Scotland. Alternative options which branch off this longest route are routed from the proposed English Landfall at Theddlethorpe to the point where it converges with the longest route; and through Holderness Offshore MCZ. KP 0 is defined at the Anderby Creek Landfall. KP markers are illustrated in Figure 19-2 (Drawing: C01494-EGL3&4-LOC-002).

19.1.7 KPs are referenced as follows:

- The preferred offshore route:
  - EGL 3: 3_KP 0 – 3_KP 436
  - EGL 4: 4_KP 0 – 4_KP 422
- Theddlethorpe option:
  - EGL 3: T3_KP 0 to T3_KP18
  - EGL 4: T4_KP 0 to T4_KP 14
- Holderness Offshore MCZ option:
  - EGL 3: H3_KP 0 to H3_KP 40
  - EGL 4: H4_KP 0 to H4_KP 39

19.1.8 Options appraisal is an integral part of the development of the Projects. The requirement to consider reasonable alternatives in the design of a project is set out in Regulation 14 of the EIA Regulations 2017[1]. In addition, under the Habitats and Offshore Habitats Regulations, if the Appropriate Assessment (AA) process concludes that a project will have an adverse effect on the integrity of a European site (i.e., Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)), NGET must be able to demonstrate that all reasonable feasible alternatives have been assessed and that the least potentially damaging option has been selected.

19.1.9 Options appraisal is used by NGET to consider the implications of the selection of certain options when developing infrastructure projects. This chapter seeks to demonstrate that reasonable feasible alternatives have been, and will continue to be, considered during the design and development of the Projects. The overall aim of the process is to ensure that the final design of the English Offshore Scheme has assessed and adequately mitigated all potential environmental effects from a physical,

[1] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

biological and socio-economic perspective whilst ensuring that it delivers on the Projects' objectives of providing essential additional electricity transmission capability between Scotland and England.

19.1.10 This section focuses on the alternative solutions considered for the English Offshore Scheme. It should be read in conjunction with Part 1, Chapter 1, which explains the need for EGL 3 and EGL 4, and Part 2, Chapter 3: Consideration of Alternatives which describes the alternatives for the English Onshore Scheme. It should be noted that all information in this section is based on the best available information at the time of writing. Engagement with stakeholders on offshore cable routeing is ongoing and will continue to influence the consideration of alternatives.

19.2 Alternative Technology

19.2.1 There are two viable options for transporting electricity: High Voltage Direct Current (HVDC) technology and High Voltage Alternating Current (HVAC) technology.

19.2.2 The UK onshore electricity transmission networks operate as HVAC systems in which the direction of the current changes on average fifty times a second. The capacity of HVAC subsea cables reduces significantly with distance, with long lengths of HVAC cable requiring electrical compensation to be installed, typically every 50 km. Electrical compensation requires a large shunt reactor which needs to be installed on a small, fixed platform (such as that used by the oil and gas industry). HVDC does not require electrical compensation (reducing the footprint of the Projects) and operates over much longer distances more efficiently. As a result of this higher efficiency of power transmission in HVDC cables, fewer materials (e.g., copper or aluminium) are required for cable manufacture, ultimately leading to fewer cables being required. This translates into cost savings for the Projects (which are passed on to consumers) and a lower environmental impact as fewer resources are required in comparison to a HVAC system.

19.2.3 The Projects propose the use of HVDC technology because it is more effective at transmitting high electricity capacity over longer distances with lower energy losses than an equivalent HVAC system. Additionally, a HVDC technology system provides a greater degree of control over the magnitude and the direction of power flow, eliminating the requirement for synchronisation between the electricity systems at either end of the link.

19.3 Alternative Offshore Cable Routes

19.3.1 Following the identification of potential Landfall sites, it was possible to start identifying potential marine cable route options. The aim was to create the shortest marine cable routes possible which would optimise the routes to ensure the cables can be buried along their extent, minimise the length of cable needed, reduce the manufacturing and installation costs, and minimise the environmental footprint of the English Offshore Scheme. It was also designed to:

- Avoid environmentally sensitive areas, where possible.
- Avoid areas which would represent restrictions to vessel movement e.g., anchorages, restricted navigation channels.
- Avoid areas of archaeological importance and wrecks.

- Avoid existing offshore infrastructure e.g., offshore wind farms, oil and gas infrastructure, marine aggregate extraction areas, aquaculture sites.
- Minimise the crossings of in-service cables and pipelines. Where it is not possible to avoid a crossing altogether, then to seek to optimise the crossing angle and to ensure that navigational safety or water depth is not adversely affected.
- Avoid hazardous seabed features e.g., mobile sediments or bedrock outcrops and sub crops.
- Minimise any impact on third party considerations such as seasonal fishing activities or local tourism.

19.3.2 Marine route alignments were developed in two distinct areas: Landfalls and an offshore section. The marine route options began at the English Landfalls and merged to a common point approximately 100 km offshore. From the first common point in English waters, the offshore routes extended to another common point in Scottish waters before splitting into further options leading to the Landfalls in Scotland. This led to two offshore marine route alignments being developed (Offshore Route A and Offshore Route B) and six marine route alignments to English Landfalls from each offshore route.

19.3.3 Each marine route alignment was assessed based on its own merits, technically and environmentally, taking into consideration any information available from other major developments in the region. They were also assessed in combination with the merits of the associated Landfalls and co-joining marine cable route alignments, to prove that the end-to-end solution meets the objectives of EGL 3 and EGL 4 (also refer to Part 1, Chapter 1).

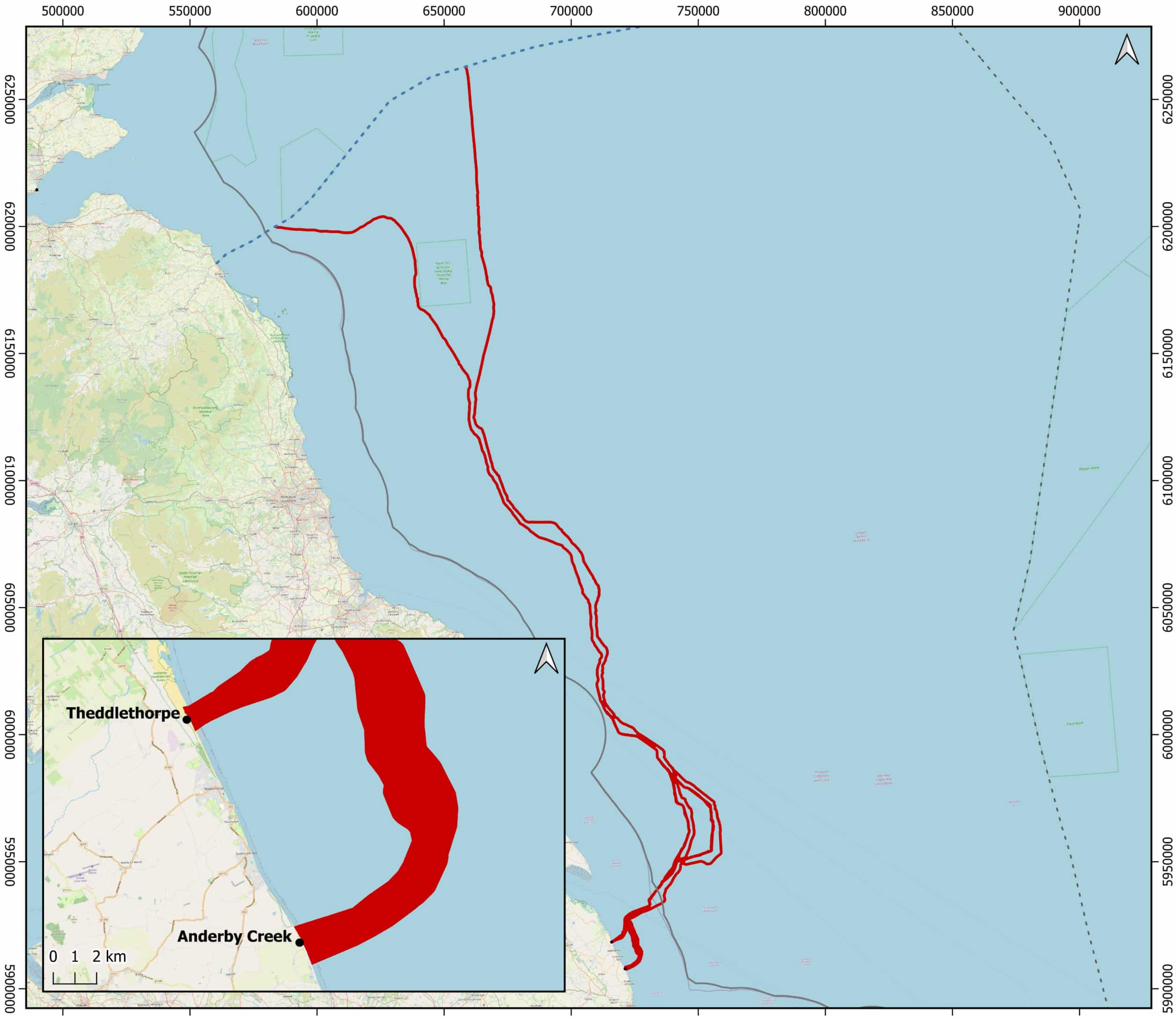
19.3.4 An iterative, phased process was used to assess these marine route alignments which consisted of workshops (including input from technical and environmental disciplines from both the marine and terrestrial teams), key marine statutory stakeholders and industry consultation followed by either a second set of workshops or refinement of marine route alignments with further targeted stakeholder engagement and follow-up decision-making workshop. This process resulted in two phases of marine route alignment before the emerging preferred marine cable route option for the Projects was selected, which are presented in this EIA Scoping Report.

19.3.5 Two marine routes are being investigated for EGL 3 and EGL 4 within the English Offshore Scheme; one that largely avoids the Holderness Offshore MCZ by routeing around the eastern boundary but crosses the northern tip of the Silver Pit glacial tunnel valley feature; and one that crosses directly through the MCZ. The Scoping Boundary encompasses both options. For the EGL 3 marine route the centreline for the eastern route option avoids the MCZ (although the Scoping Boundary overlaps for 1.2 km), whilst the alternative marine route option crosses the site for 21.1 km. For EGL 4 marine route the eastern route option crosses the site for 9.5 km whilst the alternative marine route crosses the site for 20.8km. A marine survey has been conducted on both route options to collect as much data on the site as possible in order to make an informed decision. The Joint Nature Conservation Committee (JNCC) and Natural England (NE) will continue to be consulted, to inform the decision-making process and selection of the preferred option.

19.4 Alternative Construction Techniques

19.4.1 There are a variety of alternative construction techniques available for power cables. The decision as to which combination of techniques to choose influences how the Projects will affect the environment. Typically, the selection of alternatives will depend on the individual constraints and environmental conditions at any point along the cable route, meaning that different techniques may be appropriate at different locations. For example, surface cable lay with external cable protection may be necessary where ground conditions (e.g., outcropping bedrock) will not allow burial in the seabed, however burial in the seabed may be the most feasible solution for the remainder of the marine cable route.

19.4.2 Site-specific surveys will be carried out to inform engineering decisions and the selection of installation solutions. In the absence of detailed engineering, for the purposes of scoping it has been assumed that any installation technique could be used. The design parameters considered by this Scoping Report are presented in Part 3, Chapter 20.



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The English Offshore Scheme Scoping Boundary

C01494-EGL3&4-LOC-001-B

- - - Exclusive Economic Zone Limit (EEZ)
— 12NM Limit
- - - Scottish Adjacent Waters
Scoping Boundary
● Landfall Site

0 10 20 NM

0 25 50 km

Date	17/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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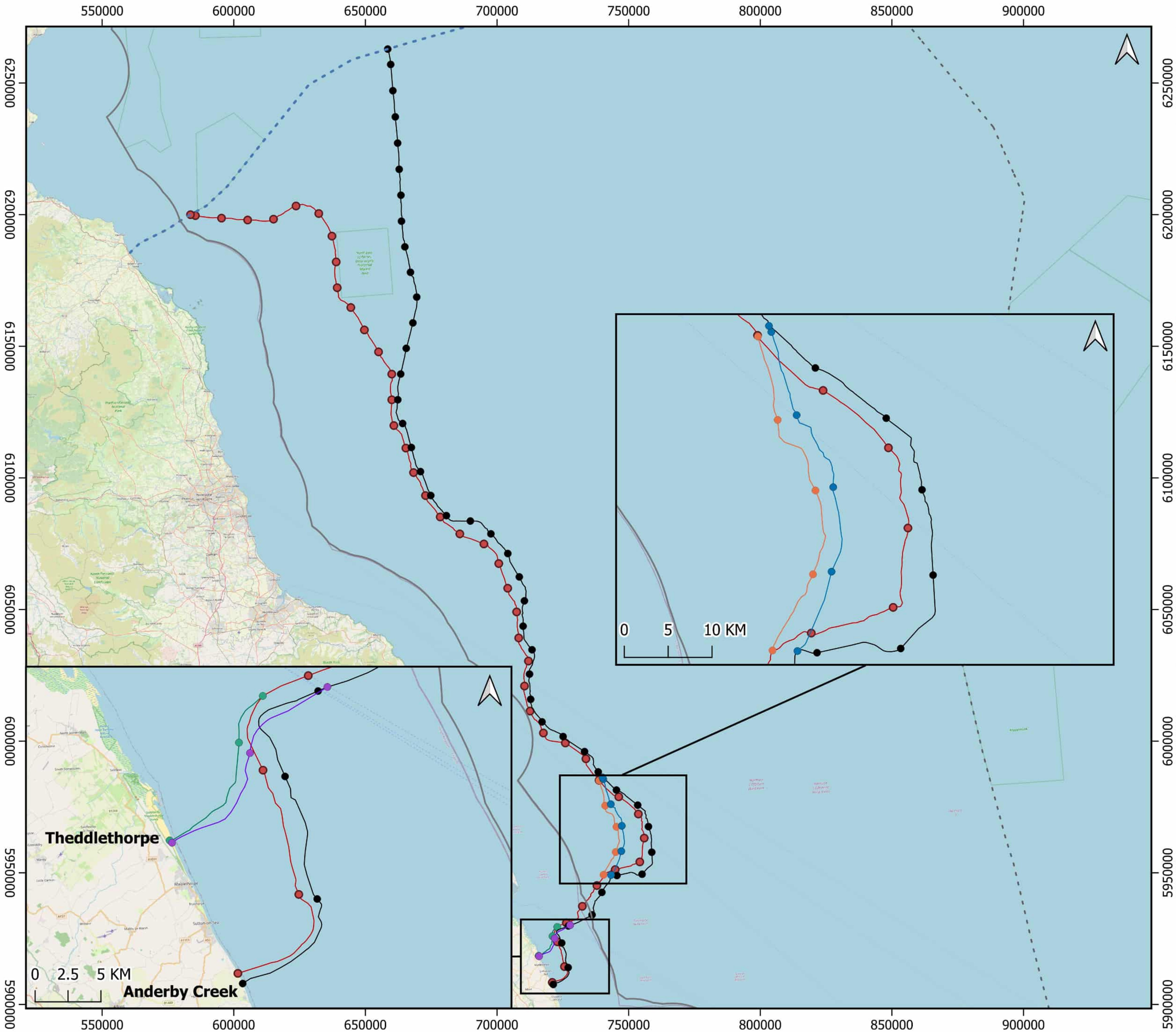

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EGL 3 & 4 Cable Route Options

C01494-EGL3&4-LOC-002-B

0 100 200 KM

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters

Cable Route Kilometre Points (KPs) 10 km Interval

- EGL 3 Preferred Route
- EGL 3 Theddlethorpe
- EGL 3 Through Holderness Offshore MCZ
- EGL 4 Base Route
- EGL 4 Theddlethorpe
- EGL 4 Through Holderness Offshore MCZ

Cable Route Options

- EGL 3 Preferred Route
- EGL 3 Theddlethorpe
- EGL 3 Through Holderness Offshore MCZ
- EGL 4 Base Route
- EGL 4 Theddlethorpe
- EGL 4 Through Holderness Offshore MCZ

0 10 20 NM

0 25 50 KM

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Unit	Meters
Scale at A3	1:1,400,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 10/07/2024

19.5 References

19.5.1 BEIS (2021) The UK's Integrated National Energy and Climate Plan. Available at: The UK's Integrated National Energy and Climate Plan - completed as per 31 January 2020 (publishing.service.gov.uk)

20. The English Offshore Scheme

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20. The English Offshore Scheme

20.1 Introduction

20.1.1 As described in Part 1, Chapter 1 and Part 3, Chapter 19, EGL 3 and EGL 4 each comprise a two gigawatt (GW) HVDC system linking Scotland and Norfolk in England, making landfall in Lincolnshire. The English and Scottish Offshore Schemes comprise:

- **EGL 3**: Approximately 575 km of subsea HVDC cable from a proposed landfall at either Anderby Creek or Theddlethorpe, Lincolnshire, to a proposed landfall at Sandford Bay, Peterhead. The submarine cable system will consist of two HVDC cables and a fibre optic cable.
- **EGL 4**: Approximately 525 km of subsea HVDC cable from a proposed landfall at either Anderby Creek or Theddlethorpe, Lincolnshire, to a proposed Fife landfall at either Kinghorn or Largo Bay. The submarine cable system will consist of two HVDC cables and a fibre optic cable.

20.1.2 Part 3 of the Scoping Report focuses on the English Offshore Scheme only which comprises all components of EGL 3 and EGL 4 within the English marine environment up to the Mean High Water Springs (MHWS).

20.1.3 This description presents information on the English Offshore Scheme components, and how they will be constructed, operated and eventually decommissioned. The chapter provides a brief overview of the English Onshore Scheme components, where they are pertinent to the English Offshore Scheme.

20.1.4 Work has been undertaken to map the environmental and socio-economic baseline to gain a better understanding of the constraints and features present in the Study Area which has informed the indicative project description presented in this Scoping Report. The design of the Projects will be developed in parallel to the EIA and will therefore evolve as the assessment progresses. The design will be influenced by engineering, environmental and commercial factors, as well as consultation with local and national stakeholders. The design envelope assessed and presented in the Preliminary Environmental Information Report (PEIR) and subsequent Environmental Statement (ES) may still include some flexibility regarding design parameters but will clearly identify where construction techniques/methodology has been restricted to mitigate significant environmental concerns.

20.1.5 As an installation contractor has not been selected and detailed design work has not yet been completed, this chapter provides an indicative overview of the anticipated submarine installation methods and intervention works. As the Projects progress, including the appointment of an installation contractor and as detailed engineering is carried out, some variation and more detailed design development will be conducted. To ensure that the realistic worst-case scenario is considered in this Scoping Report, estimated design parameters presented here seek to reflect those options that may be anticipated to result in a ‘worst case’ environmental impact. A more detailed description of the English Offshore Scheme will be presented in the PEIR and subsequently the ES (which will accompany the DCO application).

20.2 Consultation

20.2.1 The scope of this chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 20-1 summarises the responses which were received in May 2024 and the text within this chapter has been updated to reflect these responses.

Table 20-1: Summary of responses received during previous scoping consultation

Stakeholder	Summary of response received	Action
JNCC	Note the inclusion of boulder clearance methodologies including boulder ploughs. Recommend that where boulder ploughs are included in the application, a considerable level of detail is provided which explains why this tooling is the best available option and the likely impact this activity will have on the benthic environment. This is considered especially critical in marine protected areas.	Noted, comment will be addressed in PEIR / ES.
	Advise that if in-situ detonation of unexploded ordnance (UXO) is required, low-order deflagration should be prioritised, with high-order detonation only used as a contingency. An environmental impact assessment and mitigation plan would need to be provided at the time of application.	Noted, comment will be addressed in PEIR / ES.
	Recommend that the potential for repeat passes of trenching and burial equipment be carefully reviewed as part of the marine application process and suggest that if this is included as potential mitigation it is clearly detailed how and where this may be possible using information from the geophysical programme and cable burial risk assessment (CBRA). All rock placement will have to be clearly justified against the CBRA, risks to the cable and predicted burial success. JNCC note the inclusion of “imported sand placement” as a potential protective measure and would appreciate more information / opportunity to discuss the feasibility of this.	Noted, comment will be addressed in PEIR / ES. Consultation will be arranged regarding imported sand placement option.
	JNCC advise that the number and duration of vehicles to be used throughout the works are clearly presented. This includes construction and surveys pre- and post-construction. The time vessels will spend inside the Greater Wash SPA and a 2.5 km buffer around the SPA should also be clearly presented.	Noted, comment will be addressed in PEIR / ES.

20.3 Location of the English Offshore Scheme

20.3.1 The Scoping Boundary is illustrated in Figure 19-1 (Drawing: C01494-EGL3&4-LOC-001). The extent of the Scoping Boundary is approximately 436 km long in relation to the EGL 3 and 422 km long in relation to EGL 4 in English inshore and offshore waters.

20.3.2 The Scoping Boundary is nominally 1 km wide, 500 m either side of the centre lines for each of the offshore routes within the English Offshore Scheme, however it widens in areas where there is still optionality in the design e.g., to allow for micro-routeing around potential seabed features. It is anticipated that the DCO boundary will ultimately be 500 m wide for each offshore route following refinement and rationalisation as the EIA and design process evolves. As previously discussed in Section 19.1, the Projects have been assessed within a single Scoping Boundary which encompasses both the EGL 3 and the EGL 4, where forming part of the English Offshore Scheme.

20.4 Components of the English Offshore Scheme

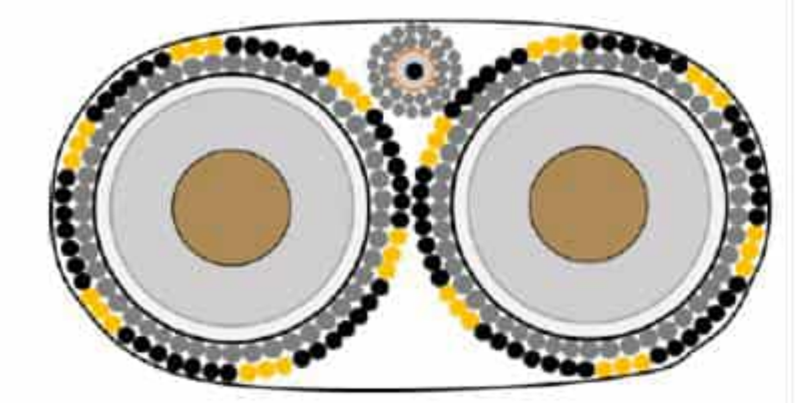
20.4.1 The English Offshore Scheme will comprise two power cables and a fibre optic cable. All references to cables in Part 3 of this Scoping Report refer to submarine cables.

20.4.2 The detailed configuration of the marine cable system is still under development at this stage and will be informed by further electrical design studies and through selection of the cable supplier and installation contractor. However, in common with similar HVDC systems recently installed by NGET, it has been assumed that the HVDC links will each comprise of two single core metallic conductors (one positive, one negative) and a fibre optic cable. The cables will be installed for the Projects either as a single bundle of two conductors and the fibre optic cable, or with the conductors laid separately in parallel, with the fibre optic cable bundled (i.e., secured) to one of the conductors. In the case that the conductors are laid separately, the separation between the conductors will be up to 30 m. Subject to detailed engineering and technical feasibility, the cable separation may be reduced to further reduce the seabed footprint of the Projects in terms of electromagnetic field effects.

20.4.3 Burial depth is typically 1.0 - 2.5 m below chart datum. The final target burial depth will be determined by a cable burial risk assessment (CBRA) which will take into consideration location specific factors such as ground conditions (i.e., ability to bury), intensity of shipping and fishing activity. The results of the CBRA will be used to inform the EIA. The Projects will share a common Landfall and run parallel to each other through English waters, with the separation distance ranging from a minimum of 118 m at the Landfall to a maximum of 7.5 km offshore.

20.4.4 The cables will likely be cross linked polyethylene (XLPE) cable, which have been used in HVDC applications since 2000, and are proven to be reliable. As illustrated in Figure 20-1, the cables have a central core (comprising of aluminium or copper), protected by insulation and a lead sheath. Heavy steel wire is wound in a helical form around the cable as armour to protect the cable from external damage during construction and operation.

Figure 20-1: Example Illustration of bundled HVDC cable with fibre optic cable (illustration shows double wire armoured sheathing and is indicative only)



20.5 Pre-Construction Activities

20.5.1 Prior to the commencement of offshore cable installation, it is essential to ensure that the seabed is clear of obstructions that may hinder the construction works. Seabed preparation is expected to involve clearance activities to ensure the proposed submarine cable corridor is clear of boulders, dropped object debris, and other obstacles. Table 20-2 summarises the activities that may be expected to take place.

Table 20-2: Pre-construction activities

Activity	Description	Assessment Approach
Pre-construction survey	Seabed surveys will be carried out in the year prior to installation by the contractor to reconfirm existing geotechnical and geophysical information regarding seabed conditions, bathymetry, and other seabed features. These may include multibeam echosounder (MBES); side-scan sonar (SSS), sub-bottom profiler (SBP), magnetometer, cable trackers etc. In addition, visual inspections may also be undertaken using a remotely operated vehicle (ROV) or other visual inspection system. Depending on the final deemed Marine Licence Conditions, pre-construction surveys may also include additional specialist studies, including geotechnical, benthic, and unexploded ordnance (UXO) investigations.	In certain circumstances the Marine and Coastal Access Act 2009 (MCAA) provides for certain activities to be exempt from requiring a Marine Licence (or deemed Marine Licence). The activities associated with the pre-construction survey would qualify as exempt activities provided that the geotechnical and environmental sample sizes are <1 m^3 (individually) and NGET can demonstrate that the survey will not obstruct or present a danger to navigation and will not have a significant adverse effect on a marine protected area. The EIA will assess the impacts of the surveys on the environment focusing on impacts of changes in underwater noise, disturbance (physical and visual) to species and disruption to other marine users (including shipping and commercial fisheries). Notices to Mariners would be published ahead of the survey commencing. Fisheries would be notified of impending survey activity through the Projects' Fisheries Liaison Officer (FLO). Appropriate consents would also be sought from The Crown Estate and NE as appropriate.
UXO Identification and Clearance	A UXO survey would be undertaken as part of the pre-construction surveys. The results of the survey will be used to identify potential UXO (pUXO).	As detailed above, the pre-construction survey will not be included in the EIA process. However, investigation of pUXO

Activity	Description	Assessment Approach
	The Projects would seek to avoid pUXO where possible through careful micro-routeing of the cables. If pUXO cannot be avoided, then further investigations would be undertaken to determine if the pUXO is UXO or ferrous debris. Identification of UXO may involve further magnetometer and ROV investigations including small excavations. If a target is confirmed as UXO, clearance activities may be undertaken e.g., removal to an alternate position on the seabed or removal for disposal on land. As a final option, in-situ detonation may be considered using either high or low order detonation (noting that the preference is for a low order detonation).	(magnetometer, ROV and excavations) is a licensable activity and will be assessed as part of the EIA process. Should these investigations confirm the presence of UXO, a separate marine licence for clearance activities would be applied for, supported by the appropriate marine environmental assessments and if required underwater noise modelling. An initial UXO desk-based assessment has been undertaken to determine the potential UXO risk, which has informed the position of the Projects routes. A more detailed UXO assessment will be undertaken to provide detail on potential UXO (age, type, size of explosive capability) that could be found in the Scoping Boundary. A high-level assessment of potential impacts of UXO clearance will be included in the EIA, noting that it is anticipated a separate marine licence will be required for UXO detonation should it be required.
Seabed preparation	Prior to the start of offshore cable construction, it is essential to ensure the route is clear of obstructions that may hinder the construction works. These obstructions include boulders, out of service (OOS) cables and smaller debris such as fish nets, wires etc. The types of seabed preparation activity that may be required are: Boulder Clearance – Should boulder clearance be required, the technique will depend on the density of the boulder field identified. The preference is to move individual boulders to an alternative seabed position using a grab deployed from a vessel. However, if the boulders are densely distributed a plough would be towed across the seabed, pushing the boulders to both sides creating a cleared swathe 5-10 m wide with berms either side of the cleared swathe; width of the	NGET acquired geophysical, geotechnical, and environmental survey data along the English Offshore Scheme routes in 2023 and 2024. These data will be used in route engineering and design studies. Where possible, the route will be micro-routed to minimise seabed preparation activities e.g., avoidance of sand waves or boulder fields. Where pre-sweeping is still required, studies will be undertaken to calculate the volume of sand to be removed and identify suitable disposal locations that retain the sediment within the local sediment system. Consultation with relevant authorities will be undertaken to

Activity	Description	Assessment Approach
	berms will be determined by environmental conditions and the plough used. Pre-Lay Grapnel Run (PLGR) – A PLGR is expected to be completed, involving towing a heavy grapnel with a series of specially designed hooks along the centre line of the route, snagging any debris on the seabed and within the top 0.5 m – 1.0 m of the seabed to confirm the construction site is clear of obstructions. Debris caught with the grapnel would be recovered to the vessel for appropriate licenced disposal ashore. Pre-sweeping of sand waves – To avoid potential future cable exposure, pre-sweeping may be required if areas of sand waves are identified along the final route centrelines. Pre-sweeping may be performed using a variety of tools including trailing suction hopper dredgers, ploughs, or controlled flow excavators. Cutting OOS Cables – Removal of OOS cables may also be required; permission would be sought from asset owners to cut OOS cables crossed by the Projects. The OOS cable would be snagged using a grapnel and then cut, with an approximately 100 m section of cable being removed from the seabed. The cut ends would be tied to a clump weight and placed on to the seabed. If the OOS cable is buried deeper than can be retrieved with the grapnel, then an ROV fitted with a dredger will be used to uncover the OOS cable. The OOS cable would then be cut using a hydraulic cutter fitted to the ROV. The removed cable will be recovered to deck and disposed of in line with a Waste Management Plan.	determine the most suitable methods for the pre-sweeping. Sediment samples will be analysed by a MMO validated lab in line with MMO requirements. Consultation will be undertaken with Fisheries Associations with respect to the location of OOS assets and how these interact with specific fishing grounds, so that mitigation can be identified if necessary.

Activity	Description	Assessment Approach
Third-party asset crossings - preparation	Where the Projects cross live infrastructure e.g., cables and pipelines, NGET will enter discussions with the asset owner to agree how the crossing of the asset should be engineered. These agreements detail the physical design of the crossing and outline the rights and responsibilities of both parties to ensure ongoing integrity of the assets. Vertical separation between the Projects' cables and third-party assets would be achieved through either placing rock on the crossing locations prior to offshore cable installation, or through the placement of concrete mattresses at the crossing location to create the required separation distance. To protect the third-party assets during cable installation minimum standoff distances for equipment (PLGR, burial tools etc.) would be agreed with the asset owner.	The EIA will identify all crossings and provide indicative crossing dimensions. Consultation will be undertaken with Fisheries Associations with respect to the locations of crossings to identify what location specific mitigation may be feasible.

20.6 Construction

Landfall

20.6.1 The Landfall is the interface between the English Offshore Scheme and the English Onshore Scheme. The approximate location for the proposed Landfall area is along the Lincolnshire coast at either Theddlethorpe or Anderby Creek, as shown in Figure 19-1 (Drawing C01494-EGL3&4-LOC-001).

20.6.2 The alignment of the onshore and offshore cables through the intertidal zone will be informed by considerations of technical, environmental, and other relevant criteria as well as the outputs from technical and engineering studies. The cable alignment across the proposed Landfall will also be dependent on the chosen alignment for the English Onshore Scheme; which will be informed by a range of technical and environmental factors.

20.6.3 A trenchless construction technique (Option 1) beneath the beach and adjacent environmental sensitivities would be the NGET's preference, but its selection is dependent on technical, engineering and environmental studies. Consequently, for completeness this Scoping Report considers basic design principles for both a trenchless solution and an 'open- cut' trenching method (Option 2) across the soft sediment beach at this stage. It is understood that the preference of the Statutory Nature Conservation Bodies (SNCBs) is for a trenchless construction technique. Table 20-3 describes the activities that could be undertaken at the Landfall and how they will be assessed.

Table 20-3: Landfall construction activities

Activity	Description	Assessment Approach
Option 1: Trenchless construction	Trenchless construction techniques include horizontal directional drilling (HDD), micro-tunnelling and using a direct pipe. These are techniques commonly used to install cable duct(s) underneath sensitive environmental features (such as sea defences, dune system, etc) or technical constraints (cliffs, shallow bedrock etc.). The information contained within this Scoping Report relates to the typical approach for an HDD construction. Subject to the size of the duct(s) required and the ground conditions expected to be encountered, the operation typically comprises the initial drilling of a small diameter pilot hole which is then increased in stages (known as the "reaming" stage), followed by the installation of a cable duct. Drilling uses inert bentonite clay and water as drilling fluid. It is expected that up to three cable ducts (one for each cable) would be installed for the Projects, although solutions to reduce this are being investigated. It is currently assumed that the length of each duct will likely extend from a compound location above MHWS to a punch-out point below mean low water springs (MLWS), indicatively 1.6 km from MHWS. The punch-out points would be defined by the geological suitability of the seabed and metocean conditions. The punch-out point may need to be excavated and would be left to either naturally back fill or would be manually infilled with excavated material. A temporary compound would be required landward of the intertidal zone. It is anticipated that this compound would contain the transition joint bay (TJB) and would be situated as close as is technically feasible above MHWS, based on the geological and geotechnical suitability of the ground and also considering coastal erosion and sea level change over the asset lifespan. The size and location of a compound has not yet been confirmed; however, as these are part of the English Onshore Scheme, these are discussed further in Part 2 of the Scoping Report	NGET acquired geophysical, geotechnical and environmental survey data at the Landfalls and in the nearshore in 2023 and 2024. This data would be used to inform detailed engineering work to ascertain the trajectory, target depth and length of the trenchless construction solution.
Option 2: Open cut trenching	This construction methodology comprises the excavation of trenches across the intertidal zone perpendicular to the water line using conventional land-based excavators. Typically, this is undertaken whilst the tide is low but can also be supported by barge mounted excavators below MLWS. A trench would be formed, the dimensions of which are to be determined following completion of the site-specific surveys and would be subject to local sediment conditions. Access to the construction site would	All potential construction methodologies will be assessed to identify any that should be excluded due to the potential for significant

Activity	Description	Assessment Approach
	be gained across the soft sediment beach via a corridor. Following the formation of the trench, the cables would either be pulled directly ashore using rollers, or ducts and messenger wires installed to facilitate cable pull-in at a later date, subject to detailed engineering. It is expected that a maximum of two open-cut trenches would be excavated through the intertidal zone of EGL 3 and EGL 4. Once the cable or ducts are installed these trenches would be backfilled. It is possible that this option would require a cofferdam. A cofferdam is typically a sheet-piled structure which can be used within the marine environment to create a safe, dry working area. If a cofferdam is required, it is expected that vibratory piling would be adopted for installation of sheet walls with percussive piling only used where required to achieve design depth.	impacts, and whether mitigation is required.

Submarine Cables

20.6.4 Table 20-4 describes the construction activities associated with the installation of the submarine cables and the assessment approach to be taken. The submarine cables will be buried into the seabed wherever feasible. However, there may be some areas where ground conditions (e.g., sub cropping/outcropping rock), or the presence of third-party infrastructure (existing cables or pipelines) would mean that the submarine cables are surface laid requiring external protection. Table 20-5 presents the maximum key design parameters, representing the worst case for assessment.

Table 20-4: Submarine cables construction activities

Activity	Description	Assessment Approach
Cable lay and burial	There are three possible configurations for cable installation and protection: pre-cut trenching and cable lay; simultaneous lay and burial (SLB); and cable lay and post-lay burial. One or a combination of these would be used, depending on the ground conditions, environmental constraints and contractor selected. Cable lay and installation operations would be performed on a 24-hour basis, to minimise installation time and the duration of any disruption to sensitive environmental receptors as well as navigation and other sea users; this would also maximise available weather opportunities, as well as vessel and equipment availability. Guard vessels may be on site to warn mariners of any lengths of unprotected cable.	NGET acquired geophysical, geotechnical, and environmental survey data, including vessel and fishing activity, in 2023/2024. The data will inform a CBRA which will define the minimum depth that the cables must be buried to protect them from external influences (e.g., dropped anchors, fishing gear interaction). The data would also be

Activity	Description	Assessment Approach
	As per industry best practice, the preferred submarine cable protection method is burial. It is not yet confirmed what subsea trenching equipment would be used to install the cables; however, it is anticipated that the some or all of the following may be required dependent on the seabed conditions present: • Jet-trenching – positioned on the seabed, a jet trencher uses a powerful water jetting tool to fluidise the seabed allowing pre-laid cables to sink to the required burial depth. The cable trench is typically left to back-fill naturally or would be manually infilled with excavated material. • Conventional narrow share cable plough – as the plough is pulled through the seabed it cuts and lifts a wedge of soil. The cable is then fed into the plough and guided down through the share to the base of the trench and the soil wedge is placed back in over the cable. For this option, the seabed level tends to recover to its natural state within several tidal cycles. • Advanced cable ploughs (vertical injectors) – deep burial ploughs using water jets fitted within the plough share to fluidise material at the leading edge of the share. Can achieve deeper burial depths (i.e., 3-6 m). The cable trench would be left to back-fill naturally. • Cutting – used in hard sediments such as clay and weak bedrock or gravelly sediments to pre-cut a trench. The cables are then laid within the trench, and burial achieved either via back-fill plough or, mass flow excavator. • Controlled Flow Excavation (CFE) – suspended above the seabed, CFE uses high pressure water jets to fluidise the seabed which allows the cable to sink to the required burial depth. The cable trench would be left to back-fill naturally. The depth to which the cables would be buried will be dependent on a combination of seabed conditions and the perceived risk and probability of potential hazards to the cables and other users of the sea (e.g., vessel traffic, anchoring activity, and demersal fishing activity). A CBRA will be conducted to inform burial depth requirements; however, it is currently anticipated that the burial depth will be 1.0 - 2.5 m.	used to identify which cable burial tools may be selected. All potential construction methodologies will be assessed in the EIA to identify whether any should be excluded due to the potential for significant impacts, and whether mitigation is required.

Activity	Description	Assessment Approach
External cable protection	As detailed above, cable burial is the preferred method of protection and any requirement for additional external protection would be considered a last resort and minimised by micro-routeing, refinement of target burial depths, selection of appropriate burial tools and remedial trenching. However, there may be areas where adequate protection of the cables cannot be achieved through burial and additional external protection is required, for example where there is insufficient sediment cover, boulders, or crossings of existing seabed assets. Options for providing external protection include: Rock Placement – this involves the construction of a continuous, profiled berm of graded rock over the cables. It may be used along sections of the cables where seabed conditions do not allow sufficient protection by burial (either planned or remedial), at crossings and joint locations, and where the cables transition from surface lay to burial such as HDD punch-out points. Rock berms would be installed using targeted placement methods, e.g., fall pipe vessels would be used rather than using side or bottom discharge vessels. Concrete Mattresses/Concrete Half Shells – Concrete mattresses are frequently used to protect submarine cables and can also be used to construct crossings over existing submarine cables and pipelines. They are flexible and thus follow the contours of the seabed or crossed assets. Concrete half shells are newer innovations in the industry which form a barrier over surface laid cables to protect them from dropped objects. Sand/Grout/Rock Bags – smaller bags filled with either sand, grout (which sets in water to the profiled shape), or rock bags can also be used to provide very localised protection, where most mechanical means such as trenchers cannot reach, such as HDD punch-out locations. Tubular Protection Systems – additional protection can be provided around the cable in the form of articulated half shells. They are generally made of either high density polyurethane (HDPE) or cast-iron. Imported sand placement – following cable installation in the trench, should insufficient sediment be present to	The deposit of substances on the seabed within the UK Marine Area is a Licensable Activity under the MCAA. Data acquired during the marine characterisation surveys would be used by engineering studies to determine locations where ground conditions may prevent burial to the required depth of lowering. A precautionary approach will be taken in the EIA with indicative locations identified and assessed.

Activity	Description	Assessment Approach
	re-bury the cables the trench may be backfilled with sand from a licensed marine extraction site. The potential requirement for additional external cable protection would be confirmed through further design development both pre- and post- consent and would be informed by offshore survey information as it becomes available. Where external protection is or may be required, details of the type, quantity and nature of each protection measure would be provided in the EIA, including estimated locations, volumes/numbers, tonnages, and likely material to be used. This would include both planned and potential remedial requirements and would be provided to characterise the nature and extent of cable protection which may be installed within territorial and offshore waters. Nature-inclusive solutions such as fronded mats, 3D printed bio/e-concrete are also being investigated and will be described in the EIA.	

Table 20-5: Subsea cable design parameters for EGL 3 and EGL 4

Parameter for EGL 3 and EGL 4	Design Envelope
Cable construction	
Number of trenches	2
Maximum separation distance between trenches	30 m
Anticipated maximum burial depth (below mudline)	2.5 m
Maximum installation tool seabed disturbance width	20 m
Maximum width of cable trench	1 m
Maximum width of external cable protection	15 m

Construction Vessels

20.6.5 A range of different vessels would be required during construction of the English Offshore Scheme. These are likely to include:

- Cable Lay Vessel (CLV): The CLV is a specialist ship designed to carry and handle long lengths of heavy power cables. The CLV would be equipped with a dynamic positioning (DP) system. The shallowest depth in which the cable ship can operate will depend on the vessel used but is typically around 10 m lowest astronomical tide (LAT), although some vessels can operate in much shallower depths.

- Cable Lay Barge (CLB): Alternatively, a CLB may be required at the proposed Landfall(s). These types of vessels typically operate in water depths less than 10 m LAT. A CLB requires a four- to six-point anchor mooring system covering an area of between 500 m and 1,000 m radius from the vessel to allow the barge to hold station whilst the installation work is undertaken.
- Jack-up/anchored barge or vessel/multi-cat: These types of vessels may be used at the trenchless technique punch-out point to support the drilling and pull-in of the cables.
- Small work boats: smaller work boats may be required to support the main construction vessels. Examples include anchor handling vessels, tugs, rigid inflatable boats (RIBs).
- Construction support vessels (CSVs): CSV include a variety of vessels that may be required to support construction activities. This may include survey vessels, diver support vessels, and general construction support vessels. CSVs are available in a variety of sizes and are adapted to undertake different roles, for example archaeological or UXO inspection, PLGR, OOS cable removal, placement of concrete mattresses etc.
- Rock placement vessels: A rock placement vessel features a large hopper (tank) to transport rock and a mechanism for deploying rock on the seabed. There are many different types of rock placement vessel, however for the purposes of this Scoping Report, it has been assumed that a flexible fall pipe mechanism for rock placement would be used whereby a retractable chute is used to control the flow of rock to the seabed.
- Guard vessel: Guard vessels are used to ensure the safety of mariners operating in the vicinity of construction and maintenance activities associated with the cable. They may be required to accompany the CLV, particularly in areas of high-frequency shipping. Guard vessels are also used to protect areas of exposed cables prior to burial or deposit of external cable protection.

20.6.6 For the purposes of the Scoping Report, it has been assumed that during cable installation, a ‘rolling’ 500 m safety zone would be applied around construction vessels and activities. An estimate of the number of vessels, vessel movements and likely duration of activities will be included in the PEIR, if available at the time of writing, and the subsequent ES.

20.7 Operation, Maintenance and Repair

20.7.1 Once buried, submarine cables do not require routine maintenance. However, it is likely that regular inspection surveys will be undertaken using standard geophysical survey equipment and/or ROV to monitor the cables’ burial depth and the condition of any external protection. Maintenance activities may be required, subject to the results of the inspection surveys, to ensure the integrity of the cables are maintained. These may take the form of remedial trenching or deposit of additional external protection. For example, maintenance works may be required to re-bury any sections of cable that have become exposed and/or to reinstate rock berms that may have become displaced.

20.7.2 The most common reason for repair of a submarine cable is damage caused by third parties, typically caused by trawlers or commercial ships’ anchors on a shallow or exposed cable segment. A repair requires removal of the damaged section of cable, insertion of an additional cable section and two additional cable joints. The additional cable length may be equal to or greater than approximately three times the depth of the water at the site, depending on how much damage the cable has sustained. The extra length of a repaired cable section means that the repaired cable cannot be returned to its exact previous position and alignment on the seabed. The excess cable would be laid on the seabed in a loop to one side of the original route to form an ‘omega’ loop or hairpin. This would then be buried into the seabed, or external cable protection would be deposited if burial is not feasible due to ground conditions or position. Depending on the size of the repair and location, a construction vessel may be stationary at a location for 1-2 weeks at a time.

20.7.3 The requirement for repair operations during the lifetime of the Projects will depend on the number of faults, location of the faults, and the burial/protection method used for the original installation. When assessing the impacts of a repair operation within the EIA, feasible worst-case scenarios will be assessed. Information on seabed characteristics would be used to identify any locations along the Projects where burial might not be feasible following a repair, and external cable protection could therefore be required.

20.8 Decommissioning

20.8.1 The minimum design life of the Projects submarine cables is 40 years, although with repairs, some cable systems last upwards of 60 years. The Projects will require a Licence or Lease from The Crown Estate. An Initial Decommissioning Plan (IDP) will be written once the final route and construction methodology is chosen. This is a legal requirement necessary to secure The Crown Estate Licence. The IDP will form the basis of the Final Decommissioning Plan which would be developed in consultation with The Crown Estate. The measures and methods for any decommissioning will comply with any legal obligations which would apply to the decommissioning of the cable when it takes place.

20.8.2 The IDP is periodically reviewed and updated in line with the applicable guidance and regulations at the time of writing.

20.8.3 The environmental impact of decommissioning the Projects will be assessed at the time of decommissioning. Removal of the cable is a similar process to the installation of the cable, but in reverse. The environmental impact can therefore not be fully assessed until the environmental conditions at the time of decommissioning are established. However, the EIA will consider the potential impacts of decommissioning of the English Offshore Scheme at a high level in line with The Crown Estate decommissioning principles.

20.9 Environmental Management

20.9.1 Prior to the commencement of construction of the English Offshore Scheme, NGET would prepare a Construction Environmental Management Plan (CEMP) and associated implementing procedures in accordance with anticipated requirements of the DML for the English Offshore Scheme. The CEMP is a tool that will set out the Projects’ commitment and approach to environmental management and will ensure that all and any Contractors (including sub-contractors) engaged during the pre-construction and construction phase of the Projects are advised of their responsibilities for environmental protection.

20.9.2 The objectives of the CEMP are to:

- Outline the applicable legislation, guidelines, licences, and permissions associated with the works.
- Highlight the mitigation identified prior to award of the licences and permissions.
- Provide the overarching framework for environmental management, highlighting the hierarchy of documentation that will be used to manage environmental impacts during the offshore construction works.
- Provide details of responsibilities in relation to environmental management, including induction training.
- Detail how environmental compliance will be audited and reported, and any non-conformance will be managed and corrected.
- Ensure consistency in approach and performance of environmental management across the engineering, procurement, and construction (EPC) Contractor and its sub-contractors during the offshore construction works.

Net Zero Targets

20.9.3 In the UK, NGET has set a target to achieve carbon neutral construction by 2026 on all projects. The ESO has also committed to be able to fully operate Great Britain's (GB's) electricity system with zero-carbon by 2025. These commitments are relevant to the delivery and operation of the Projects.

20.9.4 Furthermore, the Projects will help the UK deliver on its target of becoming net-zero in all greenhouse gases by 2050, as it will help facilitate the transmission of electricity generated from a variety of renewable sources around the UK.

20.10 Indicative Offshore Construction Programme

20.10.1 The timescales for the key stages of the English Offshore Scheme are outlined in Table 20-6.

Table 20-6: Indicative project schedule

Stage of development	Time period
Marine characterisation survey	Q3 2023 – Q3 2024
Consultation on Scoping Report	Q3 2024
Preparation of engineering and environmental studies and assessments	Q3 2024 – Q2 2025
Pre-application consultation with stakeholders	Q2 2023 – Q2 2026
Submission of DCO application	Q2 / Q3 2026
Construction (3 - 5 years)	2029

* Calendar years

21. Environmental Impact Assessment Approach and Methodology

21. Environmental Impact Assessment Approach and Methodology

21.1 Introduction

21.1.1 This section describes the approach to the ES that will be prepared to support the DCO application for the Projects. The ES will report on the approach taken, and the findings and conclusions of the wider EIA process. It will also set out the mitigation measures proposed to avoid or reduce the significance of effects to an acceptable level. The EIA will follow the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) and other relevant guidance.

21.1.2 This chapter sets out common matters that are relevant to all the English Offshore Scheme technical chapters of this Scoping Report and should therefore be read in conjunction with those chapters (Part 3, Chapters 22 – 31). Where known at this stage, any proposed divergence from the standard methodology set out below is explored within the technical chapters themselves.

21.2 The EIA Process

21.2.1 The purpose of the EIA is to provide a systematic analysis of the impacts of the Projects in relation to the existing (baseline) environment. Three main documents are required as part of the EIA process for an application for development consent. There are: the Scoping Report (this document), the PEIR and the ES.

21.2.2 The Scoping Report sets out the proposed scope of the EIA for the proposed Projects, presenting the data collected to date, as well as setting out any proposed further surveys or data collection. The Scoping Report also outlines the assessment methodology and approach that will be used for the PEIR and ES. The Scoping Report is issued to consultees by the Planning Inspectorate (PINS) on behalf of the Secretary of State (SoS) for the Department of Energy, Security and Net Zero (DESNZ) for comment on the proposed scope and methodology.

21.2.3 The EIA will address the three phases of the Projects:

- Construction – the works, activities and processes that will be required to build the Projects, including preparatory works.
- Operation and maintenance – the works undertaken during the lifetime of the Projects, after construction works are completed, during operation of the HVDC links.
- Decommissioning – the works and processes required to undertake the closure, dismantling and removal of the Projects.

21.2.4 The EIA process typically comprises a series of phases, and will include:

- A description of the Projects comprising information on the site, design and size of the development.

- A description of the aspects of the environment likely to be significantly affected by the development.
- The likely significant effects of the Projects on the environment.
- Mitigation measures required to minimise potentially significant effects.

21.2.5 Key stages within the EIA include determination of the baseline, impact prediction, mitigation and determination of the significance of effects.

21.2.6 Baseline studies will comprise a combination of desk- and site-based studies undertaken to establish the existing environmental conditions within the English Offshore Scheme area. Understanding the environmental baseline allows for an accurate assessment of the likely significant effects of the proposed Projects. The environmental baseline can also be used to inform the design and supports the development of mitigation (if necessary) and future monitoring.

21.2.7 Both beneficial and adverse likely significant effects arising from the Projects will be predicted and evaluated using appropriate specialist methods. The assessment will identify the likely significant effects of the Projects, considering integrated measures within the Projects' design intended to prevent or reduce adverse effects. Additional mitigation measures will be considered where necessary and taken into account both when identifying residual effects and assessing their significance.

21.3 Determining the Technical Scope

21.3.1 The technical scope of assessment for each environmental topic is detailed in Part 3, Chapters 22 to 31. This includes the 'scoping in' and 'scoping out' of effects to be assessed as part of the EIA. The technical scope also details the approach taken to data collection to inform environmental baselines and assessment methodologies.

21.3.2 The technical topic areas identified for assessment as part of the EIA for the English Offshore Scheme area:

- Designated Sites
- Marine Physical Processes (including metocean conditions, coastal and seabed geomorphology, and sediment and water)
- Intertidal and Subtidal Benthic Ecology
- Fish and Shellfish Ecology
- Intertidal and Offshore Ornithology
- Marine Mammals and Marine Reptiles
- Shipping and Navigation
- Commercial Fisheries
- Other Marine Users
- Marine Archaeology

21.3.3 As described in Chapter 19: Consideration of Alternatives, the final Landfall location has not yet been confirmed for the Projects. The EIA Scoping will therefore consider both Landfalls within the assessments. Each technical chapter will base its assessment on the worst case for that particular topic.

21.4 Guidance and Best Practice

21.4.1 The approach to the EIA and the production of the PEIR and ES will closely follow numerous relevant EIA guidance and industry best practice documents, including but not limited to:

- National Infrastructure Planning advice notes - insofar as the principles for good EIA practice, and approaches to related assessments (such as cumulative, transboundary, and in-combination effects) may be considered appropriate.
- Relevant guidance issued by other government and non-governmental organisations.
- Professional EIA guidance documents:
  - Guide to Shaping Quality Development (IEMA 2016)
  - Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA 2017)
- Best Practice guidance documents informing assessment:
  - Natural England Offshore wind cabling: ten years' experience and recommendations (Natural England 2018)
  - Review of cable installation, protection, mitigation and habitat recoverability (RPS 2019)
  - Receptor specific guidance as outlined in individual topic chapters.

21.5 Data Gathering

21.5.1 Data gathering for the English Offshore Scheme has already commenced. Environmental information has been collected from publicly available data sources and will be supplemented with information as agreed with relevant consultees during the Scoping and EIA process. Site-specific baseline surveys will be undertaken to fill gaps in the available data.

21.5.2 The scope of the marine characterisation surveys has been discussed and agreed with relevant stakeholders and details of agreed methodologies are provided in the receptor topic sections of this Scoping Report. The specific approach to establishing a robust baseline (upon which effects can be assessed) is set out under each parameter within this Scoping Report. It is envisaged that this approach will be subject to review following the receipt of the Scoping Opinion from the Planning Inspectorate and subsequent consultation with statutory bodies. It is also recognised that this approach may evolve over time with the collection of new data and as the design of the English Offshore Scheme advances.

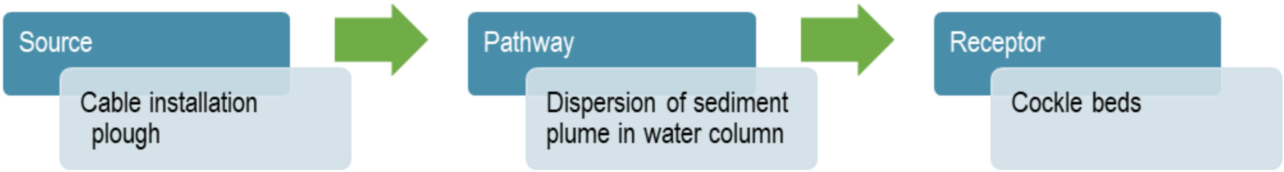
21.5.3 The relevant data currently available and a gap analysis are provided in each technical chapter of Part 3 in this Scoping Report.

21.6 Approach

21.6.1 The EIA will be undertaken within a consistent framework that will facilitate transparency in the assessment and its conclusions. The definition of terms and assessment processes that will be adopted by each of the specialist assessors is described below.

21.6.2 In general, the EIA will identify, describe and analyse the potential effects of the Projects using a source-pathway-receptor model. For instance, a project activity (source) may entail a predicted change in environmental conditions affecting either directly or indirectly (the pathway) a specific component of the baseline environment (the receptor). If the receptor is sensitive to the change it could result in either a positive or negative impact/effect. Figure 21-1 presents this model with a specific example to illustrate the concept.

Figure 21-1: Source - Pathway - Receptor model example



21.6.3 Confusion can arise whilst reading an ES due to a lack of clarification around the words ‘impact’ and ‘effect’. Throughout the assessment process, the term ‘impact’ will be used to define a change that is caused by a source. For example, cable burial using a burial tool (the source), results in dispersion of suspended sediment in the water column (the impact). Impacts can be direct, indirect, secondary, cumulative, inter-related or transboundary. They can also be beneficial, adverse or negligible. The term ‘effect’ will be used throughout the assessment (and in the ES) to express the outcome of an impact, i.e., the increased levels of suspended sediment (impact) has the potential to smother benthic communities or fish habitat (the effect).

21.6.4 The EIA will follow a sequential process as described in Table 21-1 and further outlined in Sections 21.6.1 to 21.6.5. Consultation with statutory and non-statutory stakeholders is ongoing and was started during the feasibility stage of the Projects (i.e., to inform route development and option appraisal) and will continue throughout the EIA process. Consultation will inform each of the steps outlined in Table 21-1 and is described in further detail in Section 21.10.

Table 21-1: Assessment methodology

Step		Description
1	Characterise the baseline environment	Uses publicly available information and where necessary site-specific survey to identify sensitive receptors.
2	Establish the potential impacts to be assessed	Impacts are the mechanism by which the licensable activity could influence or have a marked effect on a receptor. The nature of an impact is determined by the activity type, intensity and duration.
3	Evaluate the significance of the impact	The significance of an impact on a receptor is characterised by the sensitivity of the receptor to the impact (considering its recoverability and importance) and the magnitude of the predicted impact i.e., the duration, frequency, spatial extent and scale of change from the baseline that is predicted to occur. Combined, the sensitivity of the

Step		Description
		receptor and the magnitude of the impact are used to determine the significance of the impact.
4	Establish mitigation (where required).	Impacts which are Minor or Negligible (Not Significant) typically do not require mitigation measures other than compliance with environmental legislation and best practice. Impacts which are classified as Moderate or Major (Significant) would typically be unacceptable without the implementation of project specific mitigation designed to avoid or abate the significance of the impact. When identifying mitigation, a standard hierarchical approach has been taken as follows: • Avoid or prevent: Preferably the mitigation should seek to avoid or prevent the significant impact at source e.g., by avoiding the sensitive receptor spatially or temporally. • Reduce: If the impact is unavoidable the mitigation measures which seek to reduce the significance of the impact e.g., by reducing the footprint, duration or intensity. • Offset: If the impact can neither be avoided nor reduced then mitigation measures should seek to offset the effect through the implementation of compensatory measures. The ES will identify appropriate and feasible mitigation measures to be implemented to ensure compliance with environmental legislation and best practice and reduce environmental impacts.

21.6.5 It should be noted that where a receptor is a Primary Feature or Qualifying Feature of a European Site (e.g., SPA or SAC), or a Protected Feature of a MCZ, the ES will reference the conclusion of the information provided by NGET to support either the HRA process or the MCZ Assessment process (further described in Part 3, Chapter 22: Designated Sites).

Characterise the Baseline Environment

21.6.6 An evidence-based approach will be used throughout the assessment. The evidence-based approach involves not only utilising data collected specifically for the purposes of the Projects but also data and information from sufficiently similar projects or activities to inform the understanding of the baseline or the significance of the effect.

21.6.7 The Projects neighbour several developments, including offshore wind farms, marine aggregates areas, and other power cable or telecommunication cable projects and pipelines. Therefore, extensive data from the Marine Licensing, Environmental Statements and baseline and post-construction monitoring data are available from these developments which provide both raw data and modelling that will inform the assessments for the Projects. Where possible, appropriate, and agreed with the relevant stakeholders, NGET intends to use this existing data to:

- Aid in the characterisation of the baseline environment, where data is sufficient and appropriate to do so.
- Scope out impacts where there is a clear evidence base.

- Provide evidence for assessments where impacts are scoped in.

21.6.8 The use of this existing data is encouraged as part of several analogous industries and has for example been included in the offshore wind industry's response to Government drivers to reduce the cost of offshore wind energy. Collaborative Offshore Wind Research into the Environment has provided best practice principles for documentation and dissemination of data (COWRIE, 2008).

21.6.9 Each topic chapter will identify the source of the data used for the baseline and the impact assessment. A gap analysis has been undertaken to identify the requirement for additional data to be collected.

21.6.10 Each topic chapter provides the methodology for any new data collection (if required) including surveys. Adequate data collection will be undertaken for the purposes of the assessment, to enable the receiving environment to be robustly characterised.

21.6.11 This Scoping Report sets out to provide a detailed justification that is anticipated to facilitate the scoping out of certain topics or impacts from further assessment.

21.6.12 Mitigation that is embedded (designed-in) within the Projects will be described in the ES. Any modification of the standard approach and definitions will be fully described and justified within each section where necessary.

Establishing the Impacts to be Assessed

21.6.13 Impacts will be established by the project team based on industry experience and consultation with relevant stakeholders. Where applicable, the list of marine pressures established by the JNCC Marine Pressures-Activities Database v1.5 (2022), and NE's Advice on Operations for relevant European sites will be used to establish impacts to be assessed. These lists do not include impacts on social or human receptors.

21.6.14 For each impact the zone of influence, the spatial extent over which the pathway could affect the receptor will be established. This will be undertaken quantitatively where possible, or qualitatively based on evidence from analogous projects, post-construction monitoring data and literature reviews.

21.6.15 Receptors which occur outside of the zone of influence, and which cannot, or are unlikely to, travel into the zone of influence, will be scoped out. Conversely, mobile receptors which could travel into the zone of influence will be scoped in. Where the zone of influence is currently uncertain, the Scoping Report identifies the surveys, studies and/or assessments which will be undertaken to define it, and taking the precautionary approach impacts will be scoped in until they can be fully defined.

21.6.16 Where several activities (sources) result in the same impact, or the construction technique has not been determined, the maximum spatial extent will be assumed.

Assessment of Effects

21.6.17 Effects will be presented within the ES as 'significance of effect', which will consider the magnitude of an impact in combination with the importance and/ or the sensitivity of the receptor or resource, in line with defined significance criteria.

21.6.18 The assessment process will consider the following:

- The magnitude of the impact.

- The sensitivity of the receptor to the impact.
- The probability that the impact will result in a given effect.
- The significance of the resulting likely environmental effect.
- The level of certainty inherent within the assessment.

The Magnitude of Impact

21.6.19 The magnitude of an impact provides a useful initial measure of the likelihood of an environmental effect arising. Magnitude is defined for the purposes of assessment via four factors:

- Extent – The area over which an impact occurs.
- Duration – The time for which the impact occurs.
- Frequency – How often the impact occurs.
- Severity – The degree of change relative to the baseline level.

21.6.20 The assessment will use the criteria established in Table 21-2.

Table 21-2: Criteria for characterising the magnitude of an impact

Magnitude	Definitions	
	Physical/Biological	Socio-Economic
High	Impacts are of long-term (>15 years) through to long-term/permanent duration and/or on a regional or population/habitat level or major alteration to key elements/features of the baseline condition such that post-impact baseline character will be fundamentally changed. Natural recruitment will not return the population/habitat to the baseline condition.	Total loss of, or major alteration to key elements or features of the pre-project conditions, such that the post-project character or composition of the feature would be fundamentally changed.
Medium	Impacts are of medium term (7-15 years) duration and/or on a local level (wider than project footprint) or alter an element of the baseline conditions such as that post-impact the damage to the baseline is above that experienced under natural conditions but with no permanent effect on integrity.	Loss of or alteration to key elements or features of the pre-project conditions, such that the post-project character of the feature would be partially changed.
Low	Impacts are temporary (<1 year) or short term (1-7 years) in duration, site specific and/or a minor shift away from the baseline condition such as that experienced under natural conditions. Impacts limited to within the project's footprint. Negligible contribution to cumulative effects.	Minor alteration from pre-project conditions.

Magnitude	Definitions	
	Physical/Biological	**Socio-Economic**
Negligible	Very little or no detectable change from baseline conditions. Disturbance is within the range of natural variability. Impacts predicted to be brief (one to two days) or for a short period (up to 3 months). No contribution to cumulative effects.	No or unquantifiable change to pre-project conditions.

Sensitivity to the Impact

21.6.21 The criteria provided in Table 21-3 will be used to characterise the sensitivity of the receptor and the magnitude of the impact. The sensitivity of the receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. The sensitivity of the receptor is therefore quantified via the following factors:

- Value - A measure of the receptor's importance, rarity and worth.
- Adaptability - The degree to which a receptor can avoid or adapt to an impact.
- Tolerance - The ability of a receptor to accommodate temporary or permanent change without a significant adverse impact.
- Recoverability - The temporal scale over and extent to which a receptor will recover following an impact.

21.6.22 The assessment will use the criteria established in Table 21-3. If the approach differs for a specific receptor, the criteria used will be outlined in the topic chapter. An example of this are heritage assets. The National Planning Policy Framework (NPPF) (MHCLG, 2021) states that heritage assets should be recognised as “an irreplaceable resource” and to “conserve them in a manner appropriate to their significance”. Archaeological receptors cannot typically adapt, tolerate or recover from physical impacts resulting in material damage or loss caused by development. Consequently, the sensitivity of each receptor is predominantly quantified only by their value. Where receptors are considered to be capable of adapting to, tolerating or recovering from indirect impacts, these factors were incorporated into an assessment of their sensitivity.

Table 21-3: Criteria for characterising the sensitivity of receptors

Sensitivity	Definitions		
	Physical	**Biological**	**Socio-Economic**
High	Receptor has low/no capacity to return to pre-impact conditions i.e., recovery will take longer than 10 years. High or very high importance and rarity,	Receptor is of very high or high importance and rarity, international or national scale. Receptor has low tolerance to change i.e., recovery will take longer than 10 years following	Receptor is economically valuable and has low/no capacity to return to pre-impact conditions, e.g., low tolerance to change and low recoverability such as loss of access with no

Sensitivity	Definitions		
	Physical	**Biological**	**Socio-Economic**
	international or national scale.	the cessation of activity or will not occur. The licensable activity is taking place during a sensitive season.	alternatives or the impact will have major financial consequences for the receptor.
Medium	Receptor has intermediate capacity to return to pre-impact conditions i.e., between 5 to 10 years. Medium importance and rarity, regional scale.	Receptor is of medium importance and rarity, regional scale. Receptor has intermediate tolerance to change i.e., recovery to pre-impact conditions is possible between 5 and 10 years.	Receptor is of intermediate economic value and/or is tolerable to change e.g., acceptable alternatives with minor financial consequences.
Low	Receptor has high capacity to return to pre-impact condition within 1 year or up to 5 years. Low importance and rarity, local scale	Receptor is of low importance and rarity, local scale. Receptor has high tolerance to change with recovery to pre-impact conditions between 1 and 5 years.	May affect behaviour but is not a nuisance to user, with acceptable financial consequences e.g., short-term, reversible changes.
Negligible	The receptor is tolerant to change with no effect on its character. Not considered to be important. Common or widespread.	Receptor is common or widespread. The receptor is tolerant to change with no effect on its character. Recovery expected to be relatively rapid, i.e., less than approximately six months following cessation of activity.	The receptor is tolerant to change with no effect on its character.

The Determination of Effect Significance

21.6.23 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 proposed to be used throughout all topic areas to ensure a consistent approach within the assessment.

21.6.24 The terms assigned to categorise the significance of effects, where they are predicted to occur, can be described as follows:

- **Negligible**: beneficial or adverse - where the Projects would cause no discernible improvement in or deterioration of the existing environment.

- **Minor:** beneficial or adverse - where the Projects would cause a barely perceptible improvement in or deterioration of the existing environment.
- **Moderate**: beneficial or adverse - where the Projects would cause a noticeable improvement or deterioration of the existing environment.
- **Major:** beneficial or adverse - where the Projects would cause a considerable improvement or deterioration of the existing environment.

21.6.25 For example, if the magnitude of the impact is assessed as High (negative) and the sensitivity of the receptor is assessed as Negligible, then the significance would be Minor adverse (see Table 21-4). Those effects which are assessed as Moderate or Major will be considered as Significant effects. It is expected that feasible and cost-effective project specific mitigation is proposed to avoid, reduce and offset the significance of the effect. It is also expected that the residual effect has been subject to measures such that the remaining effects are reduced to as low as reasonably practicable (ALARP) and that no further mitigation is feasible. Those effects which are assessed as Negligible and Minor will be considered as Not Significant effects. They can be adequately controlled by best practice and legal controls and opportunities to reduce the significance of effects through mitigation may be limited and are unlikely to be cost effective.

Table 21-4: Significance matrix

		Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Negative magnitude	**High**	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible
Beneficial magnitude	**Negligible**	Minor	Minor	Negligible	Negligible
	Low	Moderate	Minor	Negligible	Negligible
	Medium	Major	Moderate	Minor	Negligible
	High	Major	Major	Moderate	Minor

21.6.26 Predictions of impact will be based on the best available data using a combination of professional judgement, expert knowledge and modelling where appropriate. The precautionary principle will be applied to ensure that potential effects are not ascribed unduly low probability of occurrence or low levels of significance.

Acknowledging Levels of Certainty

21.6.27 The assessment needs to be robust and so will seek to describe and take into account the degree of uncertainty inherent in, for instance, the data used in the assessment, the identification of activities and impacts, the confidence in determining impact magnitude and receptor sensitivity, and in assigning significance levels to predicted resulting effects.

21.7 Mitigation and Monitoring

21.7.1 Appropriate mitigation measures will be explored to eliminate, minimise or manage identified potentially significant effects on the environment. Best practice strategies for mitigation are widely practiced and will be followed when considering the methods of dealing with the environmental impacts of the Projects. The strategy comprises the methods listed in Table 21-5.

21.7.2 Where changes are required to be made to the design of the Projects during the iterative assessment process, these measures will be clearly identified within the ES. The clear inclusion of these measures within the ES will demonstrate the commitment to these measures. Where required, these measures will be secured by the deemed Marine Licence as part of the DCO. By employing this method, the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual effect that the Projects will have, should it be approved and constructed absent any specific mitigation.

21.7.3 The assessment is then repeated for the revised 'maximum adverse scenario' until:

- The effect has been reduced to a level that is not significant; or
- No further changes may reasonably be made to the design parameters to reduce the magnitude of the impact, thereby permitting the presentation of an effect that is still significant.

21.7.4 In some instances, additional mitigation measures will be outlined in the topic chapters. Additional mitigation measures may be deemed necessary where:

- An effect is significant, even with embedded mitigation, but additional mitigation measures are available to reduce the level of effect; or
- Mitigation has been proposed but has not yet been agreed with regulators, stakeholders, etc. or it is unproven.

21.7.5 Where relevant, these additional mitigation measures will be outlined in the topic chapters, after the assessment of significance section.

21.7.6 Table 21-5 outlines the proposed mitigation strategy to be undertaken in the ES.

Table 21-5: Mitigation Strategy

Avoidance	Where viable, the Projects will be designed to avoid impacts. Avoidance will also be considered during the assessment of alternative routes.
Reduction	Reduction (through the use of mitigation or different techniques) will be considered when all options for the avoidance of impacts have been exhausted or deemed to be impractical. For example, alternative methods of external cable protection would be considered to reduce impact.

Compensation	Where the potential for avoiding and reducing impacts has been exhausted, consideration will be given to providing compensation for residual impacts to make the proposal more environmentally acceptable.
Remediation	Where adverse effects are unavoidable, consideration will be given to limiting the level of impact by undertaking remedial works.

21.8 Cumulative Effects

21.8.1 A Cumulative Effects Assessment (CEA) is required under Schedule 4 paragraph 5(e) of the EIA Regulations 2017. Cumulative effects are defined as those effects on a receptor that may arise when the Projects are considered together with other existing and/or approved projects.

21.8.2 The approach to the CEA will be based on "PINS Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects" (PINS, 2019). Additional guidance from "A Strategic Framework for Scoping Cumulative Effects" (MMO, 2014) will also be used. Further information on the approach to CEA is provided in Part 4 of the Scoping Report.

21.8.3 Cumulative impacts of the Projects will be assessed to identify where there could be an accumulation of impacts on a sensitive receptor, which could result in the need for further mitigation (for instance a large number of minor effects may coincide to result in an adverse effect of greater severity/harm overall).

21.8.4 Cumulative impacts consider other proposed developments within the context of the site and any other reasonably foreseeable proposals in the vicinity including:

- Those under construction.
- Permitted application(s), but not yet implemented.
- Submitted application(s) not yet determined.
- Projects on the Planning Inspectorate's Programme of Projects.
- Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
- Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

21.8.5 It is proposed that projects that are built and operational at the time that survey data were collected have been classified as part of the baseline conditions but will be considered again if appropriate in the CEA.

21.8.6 For those projects that are only partially constructed or have only recently been completed, the full extent of the impacts arising from the development(s) may not be known and therefore will be included within the CEA.

21.8.7 In assessing the potential cumulative impact(s) for the Projects, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans or at early project stages may or may not actually be taken forward. There is thus a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For this reason, all relevant projects/plans considered cumulatively alongside the Projects will be allocated into 'Tiers', reflecting their stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out.

21.8.8 Impacts scoped in for assessment for individual receptors, as described in the scoping assessment tables within each chapter, will be assessed for cumulative effects utilising the methodology described above.

21.9 Transboundary Effects

21.9.1 The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) sets out the obligations of Parties to assess the environmental impact of certain activities that have the potential to have transboundary effects at an early stage of planning and to notify and consult other States in cases where there is likely to be significant adverse environmental impact across boundaries on those States.

21.9.2 The English Offshore Scheme lies wholly in UK waters. Given the approximate distance of 130 km to the UK EEZ boundary, there is no potential for international transboundary impacts.

21.9.3 At the marine interface between English and Scottish waters, there is the potential for intra-project effects - effects between different components of the same project from activities which are geographically or spatially close to each other and have the potential for impacts on receptors that overlap spatially or temporally. The scope of intra-project effects between English and Scottish waters is limited. The effects from the cable installation will move with the installation spread; it is a continuation of effects along the linear project. The significance of effects will be considered by the individual EIA for each UK country. Where there is the potential for intra-project effects this will be discussed in the CEA.

21.10 Consultation

21.10.1 NGET is committed to proactive, open and transparent dialogue and engagement with all stakeholders, regulators, and communities which may be affected by or indeed may affect the Projects. NGET recognises that consultation is a critical activity in the development of a comprehensive and balanced assessment.

21.10.2 As part of the assessment process, engagement with statutory consultees, non-statutory consultees, and the public will take place. There are statutory requirements for consultation as part of the DCO application. This engagement will provide an opportunity to:

- Inform statutory consultees, members of the public and other bodies with a particular interest, of the English Offshore Scheme, and provide them with an opportunity to comment.
- Take into consideration the expertise and knowledge of local communities, experts and interest groups.
- Supplement baseline information for technical chapters.

- Seek opinions on potential impacts, the approaches taken to determine significance of effects, and the development of appropriate mitigation measures.
- Encourage stakeholder participation in future decisions.

21.10.3 Engagement for the English Offshore Scheme that has occurred 'pre-scoping' has focused on providing stakeholders with the opportunity to influence the design of the English Offshore Scheme. Feedback received throughout 2023 and 2024 has influenced the selection of the proposed Landfalls and the position of the Scoping Boundary. All pre-application engagement is being recorded in a stakeholder engagement tracker and a summary report outlining all pre-application engagement will be provided alongside the EIA.

21.10.4 The scope of the technical chapters was consulted on in May 2024 through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Responses received have been summarised within each technical chapter, with signposting to where updates have been made in this Scoping Report if applicable. A copy of the non-statutory scoping opinions for the Projects are provided in **Volume 2, Part 3**:

- Appendix 21.A: EGL 3 MMO Non-Statutory Consultation Response
- Appendix 21.B: EGL 4 MMO Non-Statutory Consultation Response

21.10.5 Statutory consultation with the required consultees will be undertaken at subsequent stages of the EIA process, to allow engagement on both the design and mitigation measures. The results of the statutory and non-statutory consultation will be utilised to inform the design of the English Offshore Scheme and the preparation of the EIA in support of the pre-application DCO process.

21.10.6 A project website has been created to inform the public about the Projects. It can be viewed at https://www.nationalgrid.com/the-great-grid-upgrade/eastern-green-link-3-and-4. This website will be used to advise the public on any project updates including consultation dates, project timeline, and any changes in the design following the various consultations.

21.11 References

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JNCC (2022) Marine Pressures-Activities Database v1.5. Available at: Marine Pressures-Activities Database (PAD) v1.5 | JNCC Resource Hub

MHCLG (2021) National Planning Policy Framework. Available at: National Planning Policy Framework - GOV.UK (www.gov.uk)

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Natural England (2018) Natural England Offshore wind cabling: ten years' experience and recommendations. Available at: EN010080-001240-Natural England - Offshore Cabling paper July 2018.pdf (planninginspectorate.gov.uk)

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RPS (2019) Review of cable installation, protection, mitigation and habitat recoverability. Prepared for The Crown Estate. Available at: https://portal.medin.org.uk/portal/start.php?tpc=015_46d296ba-2444-4bd4-9fce-56ebd84f18a7

22. Designated Sites

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22. Designated Sites

22.1 Introduction

22.1.1 As part of the DCO application, NGET is required to demonstrate that the potential beneficial and adverse effects of the English Offshore Scheme on European sites (SACs, SPAs and Ramsar sites), MCZs, SSSIs and other national conservation designations have been considered.

22.1.2 To comply with this requirement, separate stand-alone assessments must be completed and submitted by NGET to support the competent authorities' decision-making process under the relevant legislation.

22.1.3 This chapter explains the different assessment processes required for designated sites and how these will be undertaken.

22.2 Consultation

22.2.1 The scope of the designated sites assessments has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 22-1 summarises the responses which were received and the text within this chapter has been updated to reflect these responses.

Table 22-1: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
NE	It is NE's view that where a feature of a site, such as a broadscale habitat, has a clear Source-Impact Pathway then is should be scoped into the full assessment at the EIA / ES.	Broadscale habitats to be scoped in where they are a feature of an MPA.
	The development of the Projects is likely to result in cabling through the Holderness Offshore MCZ. If impacts are found to cause lasting change, then without prejudice provide measures of equivalent environmental benefit (MEEB) is likely to be required. Similarly, if the project design changes and Inner Dowsing Race Bank and North Ridge SACs cannot be avoided then without prejudice compensation is likely to be required.	Without prejudice MEEB strategy is currently under development and will be discussed with JNCC and NE.
	The Scoping Boundary for the Landfall location covers an area at Theddlethorpe and Anderby Creek. At its northern limit, the scoping boundary would result in Landfall across Saltfleetby to Theddlethorpe Dunes & Gibraltar Point SSSI. These sites overlap with the	If the Landfall at Theddlethorpe is chosen, the stated designated sites would be scoped into EIA.

Organisation	Summary of response received	Action
	intertidal area and should therefore be scoped into the EIA.	
	Would like to raise attention of the number of development projects currently seeking to make Landfall within this section of coastline. There is a need to consider each of these projects collectively to ensure that each has sufficient space without collectively conflating any nature conservation concerns. Would welcome a co-ordinated holistic network design at this location.	NGET has been undertaking and would continue to consult with other developers in the region to ensure cumulative impacts are fully understood and potential for coordination and co-location is maximised.
	Recommend review of best practice guidance “Offshore Wind Marine Environmental Assessments: Best Practical Advice for Evidence and Data Standards” as it is considered to be applicable to other marine works, as well as NE’s “Cabling Lessons Learnt” guidance.	Guidance has informed design and would continue to be referred to during development of EIA.
	Note that NE should be consulted again if the proposal is amended in any way which significantly affects its impact on the natural environment. NE must be consulted with regards to the ES, and sufficient time must be allowed in order for survey data to be fully assessed and to participate in expert topic group discussions where necessary prior to submission.	NGET has a service level agreement in place with NE for pre-application discretionary advice. This will continue to be utilised to ensure NE are consulted throughout the EIA process.
	NE advises that the potential impact of the proposal upon features of nature conservation interest and opportunities for habitat creation/enhancement should be included within this assessment in accordance with appropriate guidance on such matters: • Guidelines for Ecological Impact Assessment by the Chartered Institute of Ecology and Environmental Management. • The National Planning Policy Framework (NPPF)	Opportunities for nature inclusive design, habitat creation / enhancement will be considered as appropriate.
	NE wishes to be consulted on the scope of the HRA and the information that will be produced to support it and should be formally consulted on any AA provided for the proposal.	Noted.

Organisation	Summary of response received	Action
	The application should thoroughly assess the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006.	Noted.
	NE advises that cable protection within benthic marine protected areas should be avoided, and where this is not possible every effort should be made to mitigate the impacts. Advise the applicant should develop a cable burial risk assessment informed by comprehensive geophysical and geotechnical surveys, to be submitted as part of the application process. If cable protection is required options that have the greatest success of removal with least impact to interest features should be taken forward.	Cable protection will be avoided within designated sites where possible. Suitable mitigation measures will be proposed where the use of cable protection within designated sites cannot be avoided. A cable burial risk assessment would be developed and would be submitted with the DCO application.
JNCC	The North East of Farnes Deep MCZ and Highly Protected Marine Area (HPMA) occupy the same physical area but have different features and management approaches. JNCC recommends that the applicant ensures that these sites are clearly distinguished within the text.	Noted.

22.2.2 Further consultation will be undertaken with relevant stakeholders to supplement desk-top review, geophysical, geotechnical and physical-chemical data acquisition, studies and assessment as required.

22.2.3 The following bodies at a minimum will be consulted during the EIA process, to ensure the most-up-to-date information is collated:

- MMO
- Centre for Environment, Fisheries and Aquaculture Science (Cefas)
- JNCC
- NE
- The Crown Estate
- Environment Agency (EA)

22.3 International and National Conservation Designations

22.3.1 Sites can be designated under a range of different legislation to conserve important habitats and species. Table 22-2 lists the key international and national designations and provides a brief description of their scope. Typically, in the UK, sites which have been proposed as a designated site, but have not been formally designated, are treated as if already designated for the purposes of assessment.

Table 22-2: International and National Conservation Designations

Designation	Description
European Sites forming part of the UK National Site Network (Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar sites)	A collective term for sites protected up to 12 nautical miles (NM) from the coast under the Conservation of Habitats and Species Regulations 2017 (COHSR). The Conservation of Offshore Marine Habitats and Species Regulations 2017 (COMHSR) applies to European sites greater than 12 NM from the coast. SACs are designated for the protection of habitats listed under Annex I and species listed under Annex II of the European Habitats Directive. SPAs with marine components are designated for the protection of bird species listed under the Birds Directive 2009 (as amended) as Annex I species or those which are regularly occurring migratory species dependent on the marine environment for all or part of their lifecycle and are associated with intertidal or subtidal habitats within the SPA. Ramsar sites are 'wetlands of international importance' which contain representative, rare, or unique wetland types or are considered to be of importance for conserving biological diversity (JNCC, 2019). They are designated under the criteria of the Ramsar Convention on Wetlands which was ratified in the UK in 1976. For the purposes of legislation and management Ramsar sites are generally designated in association with relevant European sites and conservation objectives and advice on operations are provided as part of the relevant European site/European marine site.
Highly Protected Marine Areas (HPMAs)	Areas of the sea that allow the protection and full recovery of marine ecosystems, including all habitats, species and ecosystem processes within the site boundary, encompassing the seabed and water column (Defra, 2023). HPMAs prohibit extractive, destructive and depositional uses, allowing only non-damaging levels of other activities to the extent permitted by international law (JNCC, 2023). Three sites were designated in English waters (June 2023); North East of Farnes Deep (northern North Sea), Allonby Bay (Irish Sea) and Dolphin Head (eastern English Channel).
Marine Conservation Zones (MCZs)	MCZs are designated in English, Welsh and Northern Irish territorial and offshore waters under the Marine and Coastal Access Act 2009 (MCAA) to protect a range of nationally important habitats and species.
Sites of Special Scientific Interest (SSSI)	SSSIs are designated for the protection of terrestrial or marine flora, fauna, geological, geomorphological or physiographical features of special interest (JNCC, 2022). They are designated by NE under the Wildlife and Countryside Act 1981 (as amended).

Designation	Description
National Nature Reserves (NNRs)/Marine Nature Reserves (MNRs)	NNRs are managed by organisations including NE in England, the National Trust, Forestry Commission, The Royal Society for the Protection of Birds (RSPB), Wildlife Trusts, and local authorities. NNRs are areas of land which are set aside for the purpose of nature conservation as well as enabling public and educational access (Natural England, 2022). MNRs are designated under the Wildlife and Countryside Act 1981 for the conservation of marine flora and fauna and geological or physiographical features of special interest whilst providing opportunities for their study. MNRs may be established within 3 NM of the coast to the limits of UK territorial waters and encompass both the sea and the seabed.
National Parks	National Parks are funded by central government and managed by their individual authorities. They are designated as protected landscapes with the broad purpose of conserving and enhancing natural beauty, wildlife and cultural heritage and to promote understanding and enjoyment of the special qualities of national parks by the public. There are 15 National Parks in the UK (National Parks UK, 2023).
National Landscapes (formerly known as Areas of Outstanding Natural Beauty (AONBs))	National Landscapes formerly Areas of Outstanding Natural Beauty (AONBs) are landscapes which are designated for their distinctive character and natural beauty. Their purpose is the identification and protection of such areas from inappropriate development (NE, 2018). National Landscapes are designated by NE under the Countryside and Rights of Way Act (2000).
World Heritage Sites (WHS)	WHS are global sites identified by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) which are considered to be of exceptional importance for current and future understanding of cultural, scientific and environmental planetary issues (World Heritage UK, 2023). There are 33 WHS in the UK which are managed by local organisations.
UNESCO Biosphere Reserves	“Learning areas for sustainable development” which enable the study of interdisciplinary approaches to the sustainable use of biodiversity whilst maintaining its conservation (UNESCO, 2021). Biosphere reserves are internationally recognised, including terrestrial, marine and coastal ecosystems and are nominated by national governments. Their main functions include: • Conservation of biodiversity and cultural diversity • Economic development that is socio-culturally and environmentally sustainable • Logistic support, underpinning development through research, monitoring, education and training.
Marine Management Organisation (MMO),	The MMO has the power to make byelaws within 0 – 200 NM of the English coast to protect habitats and species from potentially harmful

Designation	Description
and Inshore Fisheries Conservation Authorities (IFCA) Bottom-Towed Gear Byelaws	activities under the MCAA (MMO, 2023). Byelaws relating to fishing activities are managed by the IFCAs between 0-6 NM and by the MMO between 6 and 200 NM. Within 25 km of the English Offshore Scheme Scoping Boundary both the IFCA and MMO have established bottom-towed gear byelaws which prevent the use of certain fishing gear types to protect seabed habitats and species.

22.4 Assessment Approaches

Habitats Regulations Assessment (HRA)

Legislative Context

22.4.1 The ‘Habitats Directive’ (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) protects habitats and species of European nature conservation importance. Together with the ‘Birds Directive’ (Council Directive 2009/147/EC on the conservation of wild birds), the Habitats Directive establishes a network of internationally important sites (i.e., ‘Natura 2000 Sites’) designated for their ecological status. This includes SACs and SPAs and in accordance with the Office of the Deputy Prime Minister (ODPM) Circular 06/2005 (ODPM, 2005), Ramsar sites. Collectively SACs, SPAs and Ramsar sites are referred to as European Sites in UK legislation.

22.4.2 The Habitats Directives are transposed into UK law in the offshore area (>12 NM from the coast) by The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (COMHS); and within the inshore area (<12 NM from the coast) by the Conservation of Habitats and Species Regulations 2017 (as amended) (COHSR). This legislation is collectively referred to as the Habitats Regulations.

22.4.3 Under the Habitats Regulations, the competent authority is required to undertake a HRA to determine whether there is potential for a plan or project to have an adverse effect on a European Site, alone or in-combination with other plans or projects.

22.4.4 The HRA process comprises four key stages including Screening for Likely Significant Effects (LSE), AA, assessment of alternative solutions and Imperative Reasons of Overriding Public Interest (IROPI). The AA is undertaken by the competent authority based on information provided by the applicant, usually in the form of a Report to Inform an Appropriate Assessment (RIAA) or an HRA Report. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

22.4.5 There are four stages within the HRA process:

1. Screening: The process of identifying potentially relevant European and Ramsar sites, and whether the proposed project is likely to have a significant effect on the interest features of the site either alone or in-combination with other plans and projects. If it is concluded at this stage that there is no potential for LSE, there is no requirement to carry out subsequent stages of the HRA. In accordance with recent case law relevant to the Habitats Directive and summarised in European Commission (EC) Guidance (November 2018) screening is undertaken prior to the implementation of any potential mitigation measures.

2. Appropriate Assessment and Integrity Test: Where a LSE for a European or Ramsar site cannot be ruled out, either alone or in-combination with other plans and projects, it is necessary to provide further information to enable the competent authority to carry out an AA of the implications of the project on the integrity of the site(s), either alone or in-combination with other plans and projects, in view of the site's conservation objectives. Where it is not possible to rule out an adverse effect on site integrity (AEoI) (integrity test), the HRA must progress to Stages 3 and 4.
3. Assessment of Alternative Solutions: Identifying and examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on the site(s).
4. Imperative reasons of over-riding public interest (IROPI): Where no alternative solution exists and where an adverse effect on site integrity remains, the next stage of the process is to assess whether the development is necessary for IROPI and if so, the identification of compensatory measures needed to maintain site integrity or the overall coherence of the designated site network.

Assessment Approach

22.4.6 To identify relevant European sites for consideration in the shadow HRA the following approach will be adopted:

1. Identification of the potential impacts of the Projects on primary and qualifying features of European sites.
2. Identification of European sites that interact with, or potentially have connectivity with the Projects.
3. Assessment of LSE.

22.4.7 The potential for LSE will be assessed using a source-pathway-receptor model. The 'source' is defined as the individual elements of the proposed works that have the potential to affect the identified ecological receptors both within the European site and outside of it. The 'pathway' is defined as the means or route by which a source can affect an 'ecological receptor', defined as the Qualifying Features (for SPAs) or Qualifying Interests (of SACs) for which conservation objectives have been set for the European sites under consideration.

22.4.8 Screening will be informed by a review of the publicly available datasets and the available literature that allows the characterisation of the receiving environment and supports the identification and assessment of potential impacts and their significance.

22.4.9 The examination, analysis and evaluation of the relevant information that supports the Screening process will follow the precautionary principle throughout. Mitigation will not be considered during screening. Where there is any uncertainty in the conclusion, the potential impact and European site will be screened through to the AA stage of the process. It is at this stage that mitigation measures to reduce the scale or likelihood of potential adverse effects can be proposed and incorporated into the assessment, along with the presentation of further information to inform the assessment.

22.4.10 Where the applicant's Screening concludes that AA is required, a RIAA will be prepared and submitted with the DCO application. This will be a combined RIAA that covers both the English Onshore Scheme and the English Offshore Scheme. The RIAA would be informed by the results of the seabed surveys carried out (see Part 3, Chapters 23 and 24 for details of scope). Consultation with NE and the JNCC will be undertaken throughout the assessment process to ensure that the RIAA provides sufficient information for the competent authority to carry out the AA.

22.4.11 The shadow HRA will be submitted with the ES in support of the DCO application. The impacts to the protected features of the sites will be discussed in the appropriate topic chapter of the EIA. For example, impacts on habitats will be assessed under the Intertidal and Subtidal Benthic Ecology Chapter, impacts on bird species will be assessed within the Ornithology Chapter, etc.

Marine Conservation Zone Assessment

22.4.12 Section 126 (6) of the MCAA requires that applicants seeking to undertake an activity must satisfy the competent authority that there is no significant risk of the proposed activity hindering the achievement of the conservation objectives stated for the MCZ. It should be noted that HPMAs also fall under this legislation and assessment process. There are three stages to the process for assessing the effects of a project on an MCZ.

1. Screening: The process of identifying whether S126 should apply to the project. Screening identifies whether the licensable activity is taking place within or near to an MCZ; and identifies whether the activity is capable of affecting (other than insignificantly) either the protected features of the MCZ or the ecological or geomorphological processes on which the protected features are dependent.
2. Stage 1 assessment: This stage considers whether there is a significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ. It considers whether there are alternative options of undertaking the activity that would create a substantially lower risk of hindering the achievement of the conservation objectives.
3. Stage 2 assessment: This stage looks at whether there are benefits to the public of proceeding with the project that clearly outweigh the damage to the environment and the measures the applicant will take to provide MEEB to compensate for the damage which the project will have on the MCZ.

Approach

22.4.13 To identify relevant MCZs for consideration in the Assessment the following screening approach will be adopted:

1. Identification of the potential impacts the Projects could have on protected features (including establishing the zone of influence of potential impacts).
2. Identification of MCZs that interact with, or potentially have connectivity with the Projects.
3. Assessment of potential for the Projects to hinder the achievement of conservation objectives for the relevant MCZs.

22.4.14 A similar approach to that employed for European sites will be taken for MCZs, in that assessment will use the source-pathway-receptor model. Screening will be informed by a review of the publicly available datasets and the available literature that allows the characterisation of the receiving environment and supports the identification and assessment of potential impacts and their significance. The precautionary principle will be followed throughout. Where there is any uncertainty the impact and site will be screened through to Stage 1 assessment.

22.4.15 If screening determines Stage 1 Assessment should be undertaken for an MCZ the applicant will provide sufficient information to inform the MMO’s assessment. The assessment provided by the applicants will examine whether the Projects present any significant risk to the protected features of the MCZ such that it will hinder the achievement of the conservation objectives for the MCZ. The assessment is an examination of the likelihood of the risk rather than a certainty of the risk. It is at this stage that mitigation measures to reduce the scale or likelihood of potential adverse effects will be proposed and incorporated into the assessment.

22.4.16 The Stage 1 Assessment would be informed by the results of the seabed surveys carried out (see Part 3, Chapters 23 and 24 for details of scope). Consultation with NE and the JNCC will be undertaken throughout the assessment process to ensure that the MCZ Assessment provides sufficient information for the competent authority to carry out their assessments.

22.4.17 The MCZ Assessment will be submitted with the ES in support of the DCO application. The impacts to the protected features of the sites will be discussed in the appropriate topic chapter of the EIA. For example, impacts on habitats will be assessed under the Intertidal and Subtidal Benthic Ecology Chapter, impacts on fish species will be assessed within the Fish and Shellfish Chapter, etc.

Assessment of Impacts on Other Conservation Designations

22.4.18 Most other conservation designations identified in Table 22-3 are not present within the Study Area e.g., MNRs, National Scenic Areas (NSAs), WHS, UNESCO Biosphere Reserves. Where a conservation designation is present, and the Projects have the potential to impact the protected features, this will be discussed in the appropriate topic chapter of the EIA. For example, impacts on habitats protected by an MMO/IFCA byelaw area will be assessed under the Intertidal and Subtidal Benthic Ecology Chapter, impacts on bird species cited in a SSSI designation will be assessed within the Ornithology Chapter.

22.4.19 Table 22-3 presents the potential impacts which could result in an adverse effect on qualifying features of designated sites and therefore require consideration by the relevant topic chapter of the EIA. Where applicable cross-reference has been provided to the relevant marine pressures established by the JNCC Marine Pressures-Activities Database v1.5 (2022) and NE’s advice on operations for relevant designated sites.

Table 22-3: Other conservation designations - potential impacts to be assessed

Potential Impact	Relevant Marine Pressure(s)	Geomorphological Features	Intertidal and Subtidal Benthic Ecology	Fish and Shellfish	Intertidal and Offshore Ornithology	Marine Mammals and Marine Reptiles
Temporary habitat loss/seabed disturbance	Abrasion/disturbance of the substrate on the surface of the seabed Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	ü	ü	ü	ü	ü
Permanent habitat loss	Physical change (to another seabed type or sediment type) Water flow (tidal current) changes including sediment transport considerations	ü	ü	ü	ü	ü
Temporary increase and deposition of suspended sediments	Changes in suspended solids (water clarity) Smothering and siltation rate changes (light) (heavy) Hydrocarbon & polycyclic aromatic hydrocarbon (PAH) contamination		ü	ü	ü	
Changes in distribution of prey or target species	-			ü	ü	ü
Visual or physical disturbance	Above water noise				ü	ü
Collision with project vessels	Collision above water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery and structures). Collison below water with static or moving objects not naturally found in the marine environment.					ü
Underwater noise changes	Underwater noise changes Vibration			ü		ü
Introduction or spread of marine invasive non-native species (MINNS)	Introduction or spread of MINNS.		ü			

Potential Impact	Relevant Marine Pressure(s)	Geomorphological Features	Intertidal and Subtidal Benthic Ecology	Fish and Shellfish	Intertidal and Offshore Ornithology	Marine Mammals and Marine Reptiles
Electromagnetic changes/Barrier to species movement	Electromagnetic changes Barrier to species movement			ü		ü
Temperature increase	Temperature increase		ü	ü		
Accidental spills	Hydrocarbon & PAH contamination Transition elements & organo-metal (e.g., TBT) contamination	ü	ü	ü	ü	ü

22.5 Identification of Relevant Sites

22.5.1 Each assessment will define a relevant search area within which relevant designated sites will be identified, using the following principles:

- Any designated site within or adjacent to the Projects which, using the Source-Pathway-Receptor model as described in Section 21.6, may be affected by the Projects.
- Any designated site within the likely zone of influence of the Projects, following the Source-Pathway-Receptor model.
- Any European site that is designated for mobile Annex II species (under the Habitats Directive), Annex I bird species (under the Birds Directive) that have the potential to travel to and occur within the zone of influence and be affected by the Projects.

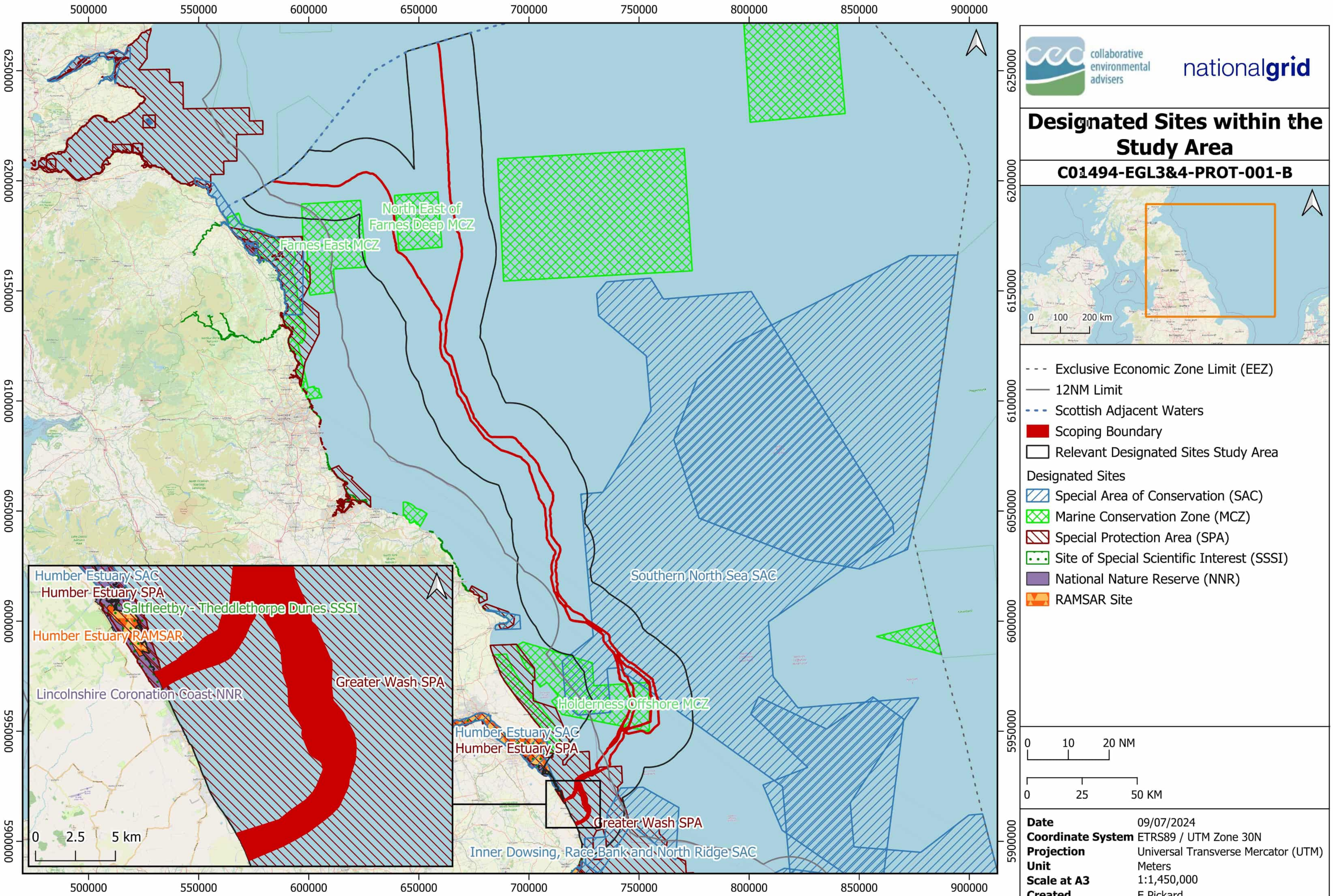
22.5.2 Using the above principles, Table 22-4 identifies a preliminary list of relevant sites that will be considered in the HRA Screening and MCZ Assessment Screening. Transboundary sites will be taken into consideration and captured in the HRA. This list will be reviewed as the Projects' design changes, consultation is undertaken with the statutory nature conservation bodies and the EIA is undertaken, and therefore may be subject to change. Designated sites are shown in Figure 22-1 (Drawing: C01494-EGL3&4-PROT-001).

Table 22-4: Relevant conservation designations

Site name & code	Designation	Intersects Scoping Boundary	Distance to Scoping Boundary*	Relevant Receptor **			
				Fish and Shellfish	Marine Mammals	Habitats and Benthic	Ornithology
Saltfleetby – Theddlethorpe Dunes and Gibraltar Point [UK0030270]	SAC	✓	-			✓	
Southern North Sea [UK0030395]	SAC	✓	-		✓		
Humber Estuary [UK0030170]	SAC		4.1 km	✓	✓	✓	
Inner Dowsing, Race Bank and North Ridge [UK0030370]	SAC		6.7 km		✓		
The Wash and North Norfolk Coast [UK0017075]	SAC		16.3 km		✓		
Berwickshire and North Northumberland Coast [UK0017072]	SAC		22.9 km		✓		
Tweed Estuary [UK0030292]	SAC		27.3 km (in relation to EGL 4)	✓			
River Tweed [UK0012691]	SAC		30.5 km (in relation to EGL 4)	✓			
Greater Wash [UK9020329]	SPA	✓	-			✓	
Humber Estuary [UK9006111]	SPA	✓	-			✓	
Flamborough and Filey Coast [UK9006101]	SPA		21.6 km				✓
Northumberland Marine [UK9020325]	SPA		23.2 km				✓

Site name & code	Designation	Intersects Scoping Boundary	Distance to Scoping Boundary*	Relevant Receptor **			
				Fish and Shellfish	Marine Mammals	Habitats and Benthic	Ornithology
Farne Islands [UK9006021]	SPA		30.7 km				✓
Holderness Offshore [UKMCZ0078]	MCZ	✓	-		✓		
North East of Farnes Deep [UKEHPMA003]	HPMA		0.28 km (in relation to EGL 4) 4.9 km (in relation to EGL 3)		✓		
North East of Farnes Deep [UKMCZ0024]	MCZ		0.28 km (in relation to EGL 4) 4.9 km (in relation to EGL 3)		✓		
Farnes East [UKMCZ0043]	MCZ		6.6 km (in relation to EGL 4)		✓		
Humber Estuary [UK11031 (663)]	RAMSAR	✓	-			✓	
Humber Estuary [TA232155]	SSSI		4.6 km			✓	
Saltfleetby – Theddlethorpe Dunes [TF481908]	SSSI	✓	-			✓	
Gibraltar Point [TF565592]	SSSI		14.6 km		✓	✓	
Teesmouth and Cleveland Coast SSSI SSSI [NZ535256]		59.1 km	✓				
Teesmouth [NZ528259] NNR		63.8 km	✓				
Lincolnshire Coronation Coast [TF456951]	NNR	✓	-			✓	

* This is the nearest distance to the combined scoping boundary, unless stated otherwise.
**Only the relevant features of the designated sites have been included.



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23. Marine Physical Processes

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23. Marine Physical Processes

23.1 Introduction

23.1.1 This chapter of the EIA Scoping Report describes the potential impacts arising from the construction, operation and maintenance and decommissioning of the Projects on marine physical processes. The marine physical environment includes the following elements:

- Hydrodynamics including water levels, currents, waves and winds;
- Geomorphology including bathymetry, geology, surficial sediments and substrate; and
- Sediment transport, including suspended sediments.

23.1.2 In addition, water and sediment quality is also included in this chapter due to their close linkages with marine physical processes.

23.1.3 There may be interrelationships related to the potential effects on marine physical processes and other disciplines. Therefore, please also refer to the following chapters found in Part 3 of this Scoping Report:

- **Chapter 24 – Intertidal and Subtidal Benthic Ecology**: outputs from marine physical environment assessments will inform the assessment of significance of effect from impacts such as temporary increase in suspended sediments and subsequent deposition.
- **Chapter 25 – Fish and Shellfish**: outputs from marine physical environment assessments will inform the assessment of significance of effect from impacts such as temporary increase in suspended sediments and subsequent deposition.
- **Chapter 26 – Intertidal and Offshore Ornithology**: outputs from the marine physical environment assessments will inform the assessment of significance of effect from impacts such as changes in water clarity effecting identification of prey species.
- **Chapter 27 – Marine Mammals and Marine Reptiles**: outputs from the marine physical environment assessments will inform the assessment of significance of effect from impacts such as changes in water clarity effecting identification of prey species.
- **Chapter 29 – Commercial Fisheries**: outputs from the marine physical environmental assessments will inform the assessment of significance of effects in relation to indirect impacts on target species.
- **Chapter 31 – Marine Archaeology**: outputs from the marine physical environmental assessments will inform the assessment of significance of effects from impacts such as temporary increase in suspended sediments and subsequent deposition which can affect heritage assets.

23.2 Study Area Definition

23.2.1 The Study Area for marine physical processes includes the Scoping Boundary plus an additional 15 km either side. This buffer is informed by the tidal excursion, which varies along the proposed Projects' routes. Regional scale modelling tools indicate that the largest tidal excursions occur at the proposed Landfalls where they are 10 km on a mean tide (equivalent to around 14 km on a spring tide), with occasional local variation. In other areas within the Scoping Boundary tidal excursions are much shorter, being around 5 km on a mean tide. The adoption of a 15 km buffer throughout provides a precautionary approach. The extent of the Study Area will be reviewed and refined for the EIA.

23.3 Data Sources

23.3.1 Data sources for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

23.3.2 A site-specific geophysical survey was carried out along the length of the Projects (including both Landfalls under consideration) during 2023 and 2024. The width of the survey was nominally 500 m, but this increased in some areas if there were features of interest that routeing sought to avoid. Preliminary interpretation of the geophysical data was undertaken onboard the survey vessel and environmental sampling stations were selected based on this interpretation. Chemical analysis of the environmental grab samples will be undertaken which will be used to inform the EIA.

23.3.3 A method statement for the survey works was agreed with JNCC, NE and Cefas prior to the survey commencing.

Publicly Available Data

23.3.4 A desk-based review of publicly available data sources (literature and GIS mapping files) will be used to supplement the site-specific geophysical/geotechnical surveys and to describe the wider baseline marine physical environment. Table 23-1 lists the key data sources which will be used in the EIA.

Table 23-1: Key publicly available data sources for Marine Physical Processes

Data Source	Description
The European Marine Observation and Data Network (EMODnet, 2020)	Digital Terrain Model (DTM).
UK Hydrographic Office (UKHO, 2014)	Admiralty bathymetric survey data used to generate navigational charts and a major data source in the EMODnet DTM.
Admiralty Total Tide (ATT) software package	Tidal planes and tidal diamonds informing water levels and tidal flows.

Data Source	Description
Environment Agency Coastal Design Sea Levels for the UK (EA, 2018)	Coastal flood boundary conditions around the coast.
UK climate change projections (UKCP, 2018)	Sea level rise predictions along the coast.
UK Renewable Atlas (ABPmer, 2017)	Maps of tidal range (spring and neap), peak tidal flows (spring and neap) and mean tidal ellipses, annual wave heights and wind speeds.
SEASTATES (ABPmer, 2018)	Modelled hindcast wind and wave data.
Climate System Forecast Reanalysis (CFSR) (Saha et al., 2010)	Hourly hindcast wind data at 0.2 degree resolution, spanning 44 years (1979 to 2023), used to drive SEASTATES.
British Geological Society (BGS, 2021)	Maps of seabed sediments, quaternary deposit thickness and structural geology offshore.
Shoreline Management Plan – SMP3 (Scott Wilson, 2010)	Local annual surveys of coastline.
JNCC Coasts and seas of the UK (Barne et al., 1995)	Region 6 Eastern England: Flamborough Head to Great Yarmouth – description of coastal landform, sediment transport and geology.
Kenyon and Cooper (2005)	Sediment transport pathways in the North Sea.
Cefas (2016)	Suspended Particulate Matter (SPM) – monthly, seasonal and annual maps.
Database on the Marine Environment (DOME, 2023)	Sediment quality data.
Environment Agency Bathing Waters map and monitoring data (Magic, 2023)	Water quality.
JNCC (2023)	Marine Designated Sites shape file layer.
Crown Estate Marine Data Exchange	Environmental Impact Assessment Report (EIAR) for English OWF projects including Triton Knoll (RWE Npower, 2012), Lincs, Lynn and Inner Dowsing (Offshore wind power, 2003), Hornsea 1 and 2.
Cefas OneBenthic Dataset (Cefas, 2024)	The OneBenthic collates seabed macrofauna and sediment particle size datasets in a cloud-based PostgreSQL platform.
Cefas' WaveNet (Cefas, 2024a)	Wave monitoring network for the UK.

Additional Studies

23.3.5 Beyond the collection of site-specific geophysical and geotechnical survey data, no additional studies are proposed to inform the EIA.

23.4 Consultation

23.4.1 The scope of the Marine Physical Processes chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 23-2 summarises the responses which were received. The text within this chapter has been updated to reflect these responses.

Table 23-2: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
Cefas Coastal Processes Team	In terms of cable burial, the balance between depth of burial (which will be taken forward in the CBRA), scour protection and local sediment transport should be assessed.	NGET intends to consult Cefas to clarify expectations around this comment.
	The beach landing site is highly dynamic – consideration should be made for the cable integrity at the end of its lifespan in terms of beach profile / cliff erosion due to climate change.	Coastal erosion assessments will inform the position of the transition joint bay and the trajectory of a trenchless solution. Assessments undertaken will inform the EIA.
	The use of mass flow excavation is a very powerful tool and is probably the most effective “disturber” of the seabed. Cefas consider that this should be used as the worst-case scenario.	NGET will review Cefas and NE advice on controlled / mass flow excavation to determine worst-case.
	Cefas recommend the inclusion of data from Cefas’ WaveNet and OneBenthic datasets during the EIA.	Noted. Data sources to be included during EIA stage.
	Consideration should be given to the likelihood of Outer Dowsing Offshore Wind Farm export cables making Landfall between Theddlethorpe and Anderby Creek and the significance of associated potential cumulative impacts.	A full cumulative impact assessment will be undertaken as part of the EIA.
NE	NE advise that the applicant should consider how the coast may alter throughout the lifetime of the project, both in terms of vertical change in beach profile and coastal retreat. Consider how cable burial and siting of infrastructure will be managed throughout the lifespan of the project. Advise that the Landfall assessment should consider the effects on hydrodynamic regime due to the presence of cable protection,	Coastal erosion assessments will inform the position of the transition joint bay and the trajectory of a trenchless solution. Coastal processes assessment, informed by modelling, will be undertaken to ensure that the Project

Organisation	Summary of response received	Action
	equipment such as jack-up rigs, cable-laying vessels and cofferdams etc. The potential impact of intertidal access and/or vehicle traffic on foreshore profile change or cliff erosion over all phases of the project.	specific and cumulative impacts on the coast and hydrodynamic regime are understood. The scope of these assessments will be agreed with Cefas, NE and the EA.
	Impacts of disturbance of subtidal and intertidal seabed morphology during decommissioning have been scoped out due to being considered as having an impact of similar or lower magnitude significance as the construction activity. Whilst uncertainty remains on decommissioning methods, decommissioning impacts for these aspects should be scoped in.	Table 23-4 has been updated.
	The project has not yet been able to rule out open cut trenching for Landfall locations. Therefore, there is potential for the project to cause modifications to tidal and wave regimes and potentially alter sediment transport, particularly within the intertidal zone. The Humber Estuary SAC and Saltfleetby to Theddlethorpe Dunes SAC are within the zone of influence for the scoping boundary. Both sites contain features which rely on sediment transport along the coast.	Table 23-4 has been updated.

23.4.2 Further consultation to inform the PEIR will be undertaken with relevant stakeholders to supplement desk-top review, geophysical, geotechnical and physical-chemical data acquisition, studies and assessment as required. The following bodies are being consulted to ensure that the most up-to-date information is collated:

- MMO
- Cefas
- JNCC
- NE
- The Crown Estate
- EA

23.5 Baseline Characterisation

Bathymetry and seabed features

23.5.1 The EMODnet DTM has been used to inform the baseline understanding of bathymetry and tidal levels across the Study Area. The DTM is based on bathymetric data from various sources including UKHO survey data.

23.5.2 Water depths across the Study Area generally increase with distance along the Scoping Boundary, being 25 m below mean sea level (MSL) offshore of Spurn Head, 55-60 m below MSL offshore of Flamborough Head and 75 m below MSL at the northern end of the Study Area (Figure 23-1, Drawing: C01494-EGL3&4-BATH-001). Other than the gradual deepening from south to north along the Scoping Boundary, significant bathymetric features in the Study Area are constrained to within approximately 50 km of the Lincolnshire coast where the naturally deep channel of the Silver Pit lies adjacent to numerous shoals and banks including the Triton Knoll sand bank, Inner Dowsing Falls and Outer Dowsing Shoal.

Water Levels

23.5.3 Data from the UK renewables atlas (ABPmer, 2017) and the ATT software package have been used to inform the baseline understanding on tidal levels across the Study Area, while data from the Environment Agency's coastal flood boundary conditions (EA, 2018) and from the UK climate change projections (UKCP18) have been used to inform the baseline understanding of non-tidal influences on water levels.

23.5.4 Water levels in the Study Area are predominantly driven by tidal processes. Tides in the Study Area are semi-diurnal, with two high and two low tides per day. Tidal planes have been extracted from the ATT software package at Skegness (at the southern extent of the Study Area on the coast) and at T022B (approximately 24 km west of 3_KP 382) and are given in Table 23-3. The tides vary across the Study Area, with largest spring tidal ranges of approximately 6 m close to the proposed Landfalls, reducing offshore and northwards to 2.5 m at the northern extent of the Study Area. Neap tidal ranges are approximately half the spring tidal range. The tide arrives from the north with high water at the northern end of the Study Area occurring approximately three hours before high water at the proposed Landfalls.

Table 23-3: Tidal levels extracted from ATT at locations in the Study Area

	Tide Level (m relative to MSL)	
	Skegness	**T022B – approx. 24 km west of 3_KP 382**
Highest Astronomical Tide (HAT)	3.6	1.9
MHWS	2.9	-
Mean High Water Neap (MHWN)	1.36	-
Mean Low Water Neap (MLWN)	-1.5	-
MLWS	-3.1	-
LAT	-3.8	-2.1

23.5.5 Non-tidal or meteorological effects can also influence the water level. The height of a 1 in 200-year return period storm surge near the proposed Landfalls in the Study Area is 4.8 m above MSL (EA, 2018).

23.5.6 UKCP18 suggests an increase in MSL of more than 0.7 m at 2100 along the Lincolnshire coastline. Future changes in storm surges have been predicted to be indistinguishable from background variation (Lowe *et al.,* 2009), although extreme surge level event frequency is likely to increase (IPCC, 2021).

Currents

23.5.7 Data from the UK renewables atlas (ABPmer, 2017) and the ATT software package have been used to inform the baseline understanding on tidal flows across the Study Area. Peak spring tidal flows are shown in Figure 23-2 (Drawing: C01494-EGL3&4-GEO-001).

23.5.8 Tidal currents in the Study Area are generally orientated southwards on the flood tide and northwards on the ebb tide. The currents close to the proposed Landfalls are bi-directional in nature, aligned with the coast, while currents become slightly more orbital in nature offshore. The fastest currents occur offshore of Spurn Head where peak spring tide current speeds are up to approximately 1.4 m/s. Current speeds reduce inshore and in a northward direction with spring tide current speeds of 1 m/s close to the proposed Landfalls and of 0.45 m/s at the northern end of the Study Area. Peak neap current speeds are approximately half the quoted peak spring tide current speeds.

23.5.9 There is a slight dominance in the southward flowing flood currents, particularly in the southern part of the Study Area. Superimposed on the regional scale flow pattern, local flow variations can be expected to occur in response to bathymetric features (for example to realign with channel features, or around banks). Surge driven flows in the Study Area are not expected to contribute significantly to sediment transport (Kenyon and Cooper, 2005).

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Bathymetry

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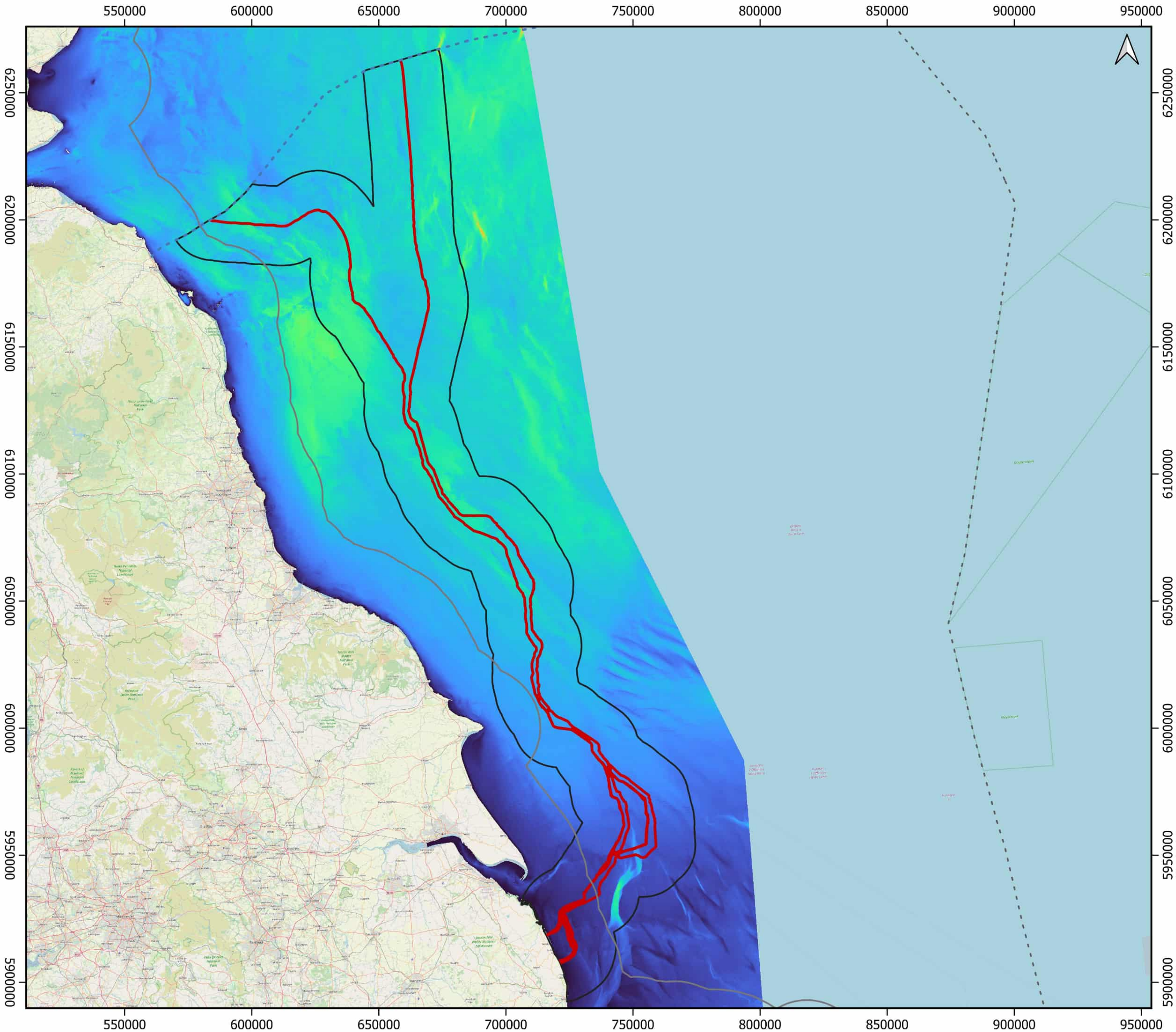

- - - Economic Exclusive Zone Limit (EEZ)
12NM Limit
Scottish Adjacent Waters
Scoping Boundary
15 km Study Area

EMODnet Bathymetry (2020)
Depth (m)

-243	-35
-200	-30
-150	-25
-100	-20
-80	-15
-60	-10
-55	-5
-50	0
-45	
-40	

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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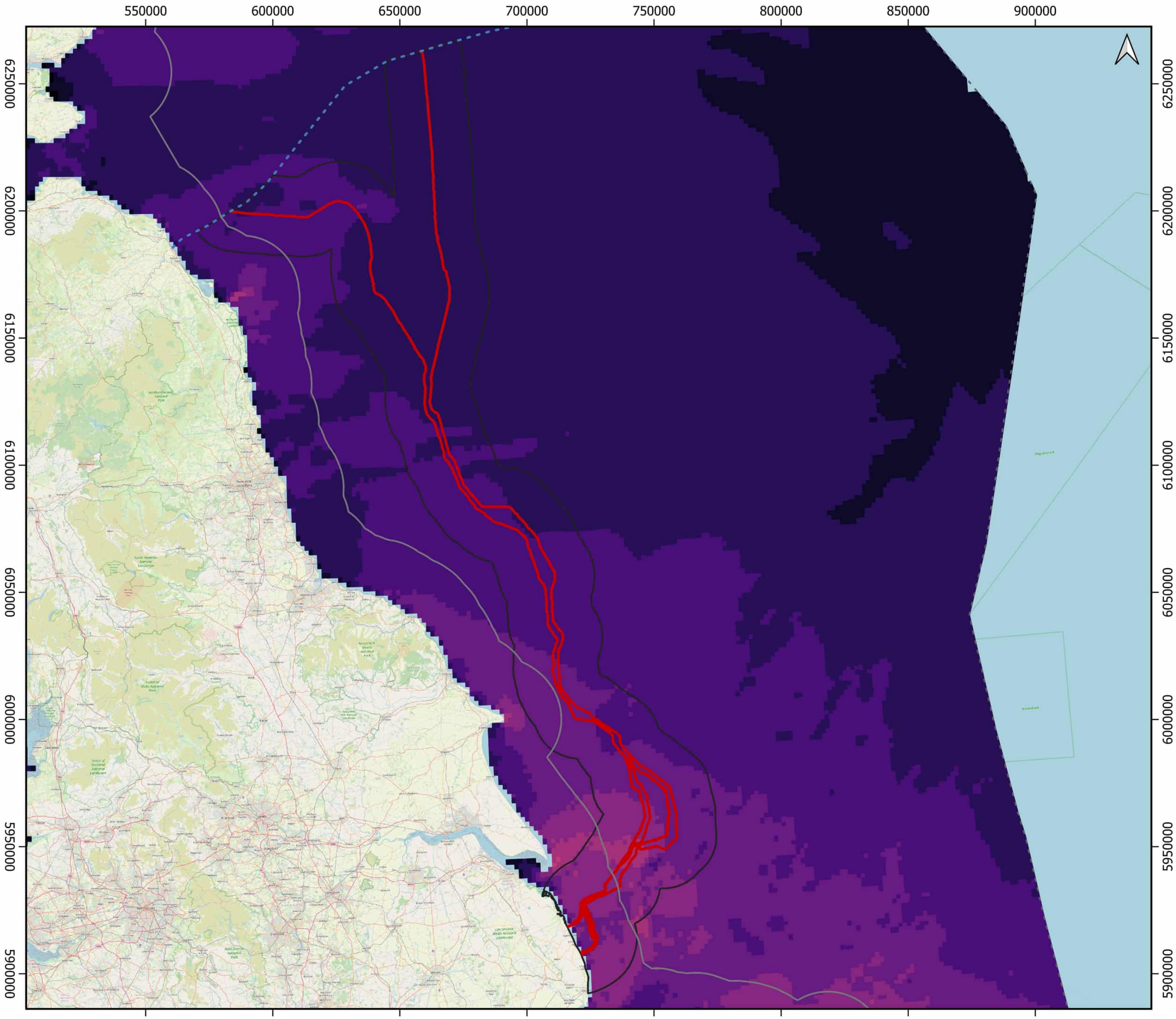
Export Date: 09/07/2024



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Peak Flow for a Mean Spring Tide

C01494-EGL3&4-GEO-001-B

Exclusive Economic Zone Limit (EEZ)
12NM Limit
Scottish Adjacent Waters
Scoping Boundary
15km Study Area

Peak Flow (m/s) (ABPmer, 2017)

- <0.11
- 0.11 - 0.26
- 0.26 - 0.51
- 0.51 - 0.76
- 0.76 - 1.01
- 1.01 - 1.26
- 1.26 - 1.5
- 1.5 - 1.75
- 1.75 - 2
- 2 - 2.51
- 2.51 - 3.01
- 3.01 - 3.51
- 3.51 - 4
- >4.00

0 10 20 NM

0 25 50 KM

Date	08/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
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Unit	Meters
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Export Date: 08/07/2024

Winds and Waves

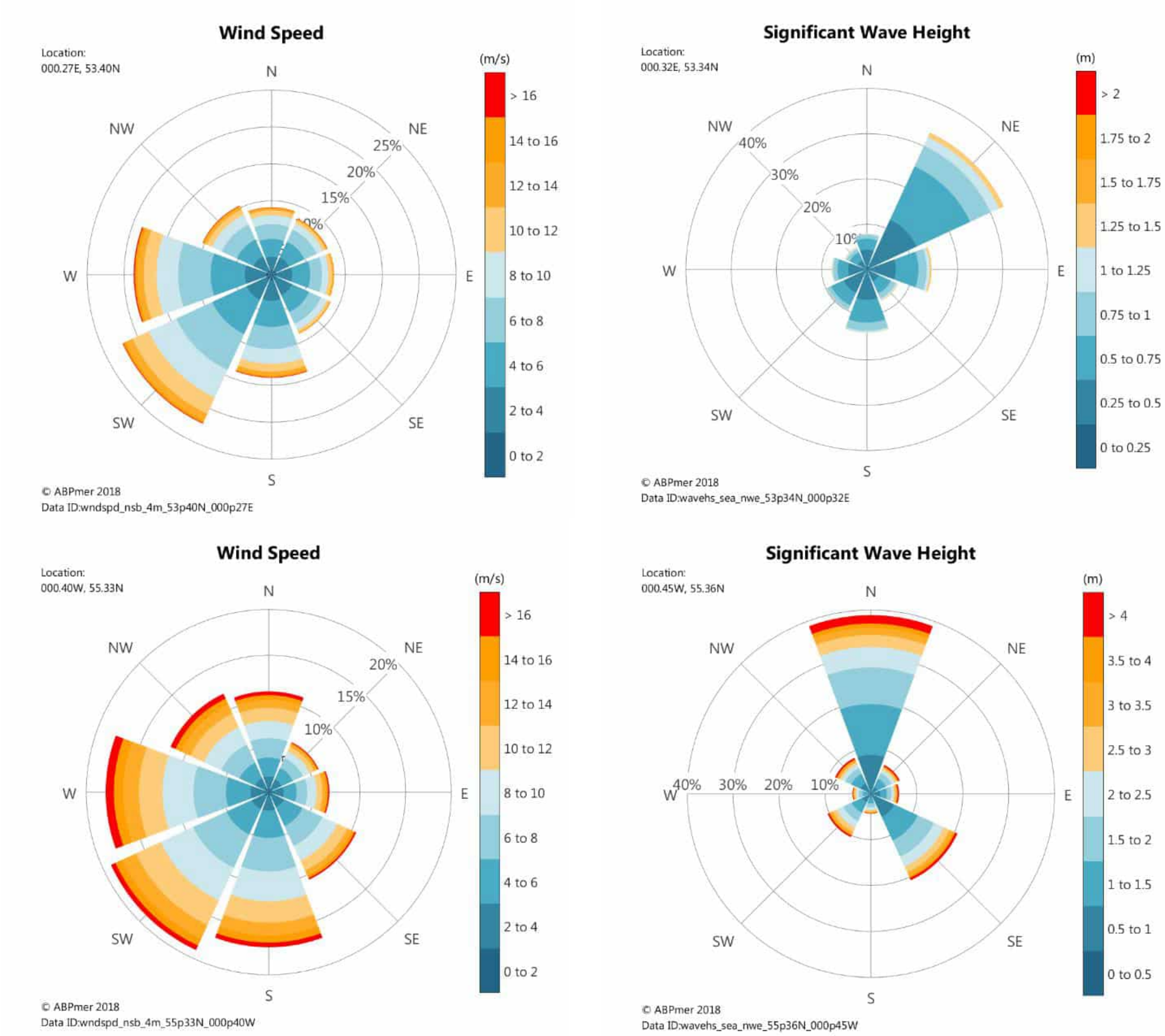
23.5.10 Climatological wind and wave data from SEASTATES (ABPmer, 2018) have been used to inform the baseline understanding of the wind and wave climate across the Study Area. SEASTATES is driven by the CFSR wind dataset (Saha *et al.,* 2010).

23.5.11 Prevailing winds across the Study Area are from south to west. The strength of the winds increases with distance offshore (due to the effect of coastal sheltering to the dominant wind directions inshore), with mean wind speeds of 6.4 m/s at 3_KP 14 / 4_KP 13 (close to the proposed Landfalls), increasing to 8.1 m/s at 3_KP 310 / 4_KP 300 (close to the northern extent of the Study Area). Wind roses at 3_KP 14 / 4_KP 13 and 3_KP 310 / 4_KP 300 are shown in Figure 23.3.

23.5.12 The wave climate across the Study Area is controlled by a combination of locally generated wind waves and swell waves generated elsewhere in the North Sea. The primary wave direction across the Scoping Boundary changes, with waves most frequently from the northeast close to the proposed Landfalls and from the north further offshore. This change reflects the varying fetch lengths for different wind directions with distance along the Scoping Boundary.

23.5.13 In addition to the change in direction, wave heights reduce in an inshore direction as a result of friction effects in the shallower nearshore waters. Mean significant wave heights close to the northern extent of the Study Area (at 3_KP 310 / 4_KP 300) are 1.7 m, reducing to 0.6 m close to the proposed Landfalls (at 3_KP 14 / 4_KP 13). There is a seasonal trend in the wave climate with smallest mean significant wave heights in the summer months and largest mean significant wave heights in the winter months (up to 2.1 m at KP 306). Wave roses at 3_KP 14 / 4_KP 13 and 3_KP 310 / 4_KP 300 are shown in Figure 23-3.

Figure 23-3: Wind and wave roses at 3_KP 14 / 4_KP 13 (upper panels) and 3_KP 310 / 4_KP 300 (lower panels) (ABPmer, 2018).



Geology and Seabed Sediments

23.5.14 The bedrock geology across the Study Area is characterised by chalk at the southern end of the Scoping Boundary, mudstone and limestone to the north of Flamborough Head and undifferentiated Triassic rocks (mix of rock, siliciclastic, argillaceous and sandstone) at the northern extent.

23.5.15 The thickness of Quaternary deposits across the Study Area is typically between 5 and 20 m, with some localised patches of thicker deposits (of more than 50 m) in the southern section of the Scoping Boundary (mainly to the south of Spurn Point) and some areas of thinner deposits (less than 5 m) offshore to the north of Flamborough Head.

23.5.16 Surficial sediments in the Study Area are predominantly a mix of sands and gravels, with sandy gravel dominating at the southern end and close to the proposed Landfalls, transitioning to sand with some patches of slightly gravelly sand, gravelly sand and sandy gravel at the northern extent of the Study Area (Figure 23-4, Drawing: C01494_EGL3&4_GEO_003).

23.5.17 The Study Area intersects some active marine aggregate extraction zones including Humber (Areas 514/1, 514/2, 514/3 and 514/4) to the north of the Scoping Boundary close to 3_KP 53 / 4_KP 53 and Off Saltfleet (Area 197), Humber Estuary (Area 400 and Area 106) and Humber Overfalls (Area 493) to the south of the Scoping Boundary close to 3_KP 29 / 4_KP 29, all of which are licenced until at least the end of 2029.

Geomorphology and Sediment Transport

23.5.18 Net sediment transport in the Study Area is southwards close to shore, driven by the tidal asymmetry (with residual tidal flows to the south) (Kenyon and Cooper, 2005). Further offshore there is a bed-load parting zone, beyond which the net sediment transport is northwards. Between 3_KP 89 / 4_KP 84 and 3_KP 156 / 4_KP 151the Scoping Boundary lies close to the bed load parting zone in an area of low net sediment transport. Further north the sediment transport is driven by wave action and little sediment transport is expected (with wave driven transport restricted to shoals and/or storm events).

Coastal Geomorphology

23.5.19 The coastline within the Study Area extends along the Lincolnshire coast from Sand Hail Flats in the north to just north of Gibraltar Point in the south. The coastline is generally made up of soft geology (predominantly gravelly sand and gravelly muddy sand) with many wide sandy beaches to Donna Nook, decreasing in width towards Mablethorpe. The beaches and sand flats are accreting, fed by sediment from the eroding Holderness cliffs, with a greater build up occurring at the top of the beaches than at the bottom resulting in a steepening of the beaches (Scott Wilson, 2010).

23.5.20 At Donna Nook and Gibraltar Point there is extensive and well-developed saltmarsh. In some locations (including Donna Nook, Saltfleetby and Gibraltar Point) sand dunes have formed.

23.5.21 The beaches between Saltfleetby and Gibraltar Point are formed of a thin layer of sand, overlying clay. Historically during storms, the thin layer of sand has been eroded exposing the underlying clay. To counter this erosion the Environment Agency has undertaken beach nourishment along the entire coast between Mablethorpe and Skegness. Much of this coastline also has a variety of ‘hard’ defences and dunes behind the beaches which, along with the ongoing beach nourishment, provide protection against flooding.

23.5.22 The Lincolnshire shoreline management plan along the coastline within the Study Area is to hold the line.

Sediment and Water Quality

23.5.23 Data from the Cefas Suspended Sediment Climatology model (Cefas, 2016) show that over the period between 1998 – 2015, mean SPM values are approximately 35 mg/l close to the proposed Landfalls (up to 3_KP 7 / 4_KP 7) reducing to 15 mg/l at 3_KP 30 / 4_KP 30 and 5 mg/l at 3_KP 51 / 4_KP 51. SPM is less than 1 mg/l from 3_KP 174 / 4_KP 169 to the northern extent of the Study Area (Figure 23-5, Drawing: C01494-EGL3&4-GEO-005).

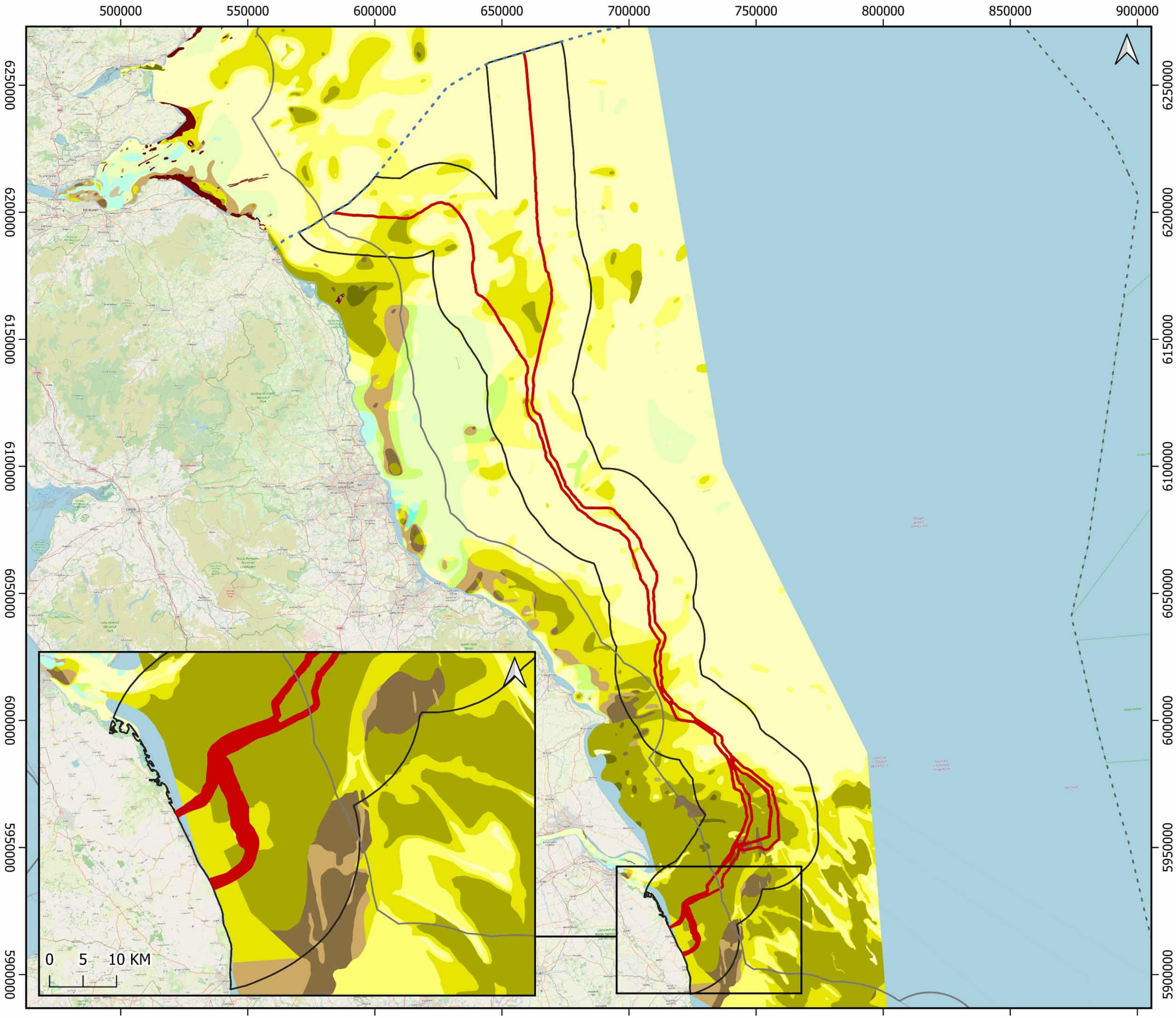
23.5.24 The Scoping Boundary passes through the Water Framework Directive (WFD) Lincolnshire water body, which is classed as a moderately exposed macrotidal water body (Water body ID GB640402492000). There are designated bathing waters (BW) at Mablethorpe Town, Moggs Eye and Anderby. All three have achieved ‘Excellent’ status for 2022, having maintained this classification for the last four bathing seasons (based on samples taken from 2018 through to 2022). Unofficially, it is considered by the Environment Agency that the full coastline from Mablethorpe to Anderby is a bathing water, as discussed during a meeting with the Environment Agency in April 2023.

23.5.25 The concentrations of metals in sediments within the North Sea are generally higher in the coastal zone and around estuaries, decreasing offshore indicating that river input and run-off from land are significant sources. The sediments within the Study Area are typically coarse sediments (sands and gravels with only low mud content), which pose a low risk for anthropogenic contaminants.

23.5.26 Analysis of sediment quality samples from the International Council for the Exploration of the Sea (ICES) DOME Portal (DOME, 2023) was conducted along the full length of the Scoping Boundary. Reported concentrations of arsenic, mercury, cadmium, chromium, copper, nickel, lead and zinc were checked for all available samples. For all sample records, contaminant levels were below Cefas Action Level (AL) 1. Sediment sampling from OWF studies also concluded that seabed sediment does not contain significant levels of pollution (although these studies were constrained to the southern part of the Scoping Boundary only).

23.5.27 There are numerous closed disposal sites within the Study Area, many of which are associated with OWF developments. These closed disposal sites include Spurn Head (HU100), Hornsea disposal area (HU209), Triton Knoll (HU204), West of Inner Dowsing Bank (HU200) and Sheringham Shoal drillings (HU123). One active dredge disposal site exists within the Study Area - the Hornsea OWF disposal area (HU205).

23.5.28 The Scoping Boundary passes through an area of gas fields, some of which remain in production. For the most part the Projects, the marine routes avoid passing through active gas fields. The only exceptions to this are the Wollaston gas field at 3_KP 138 and the alternative route through the Holderness Offshore MCZ, which passes through the Mercury gas field at H4_KP 13 and the Ceres gas field at H4_KP 16. Gas fields could be a potential source of sediment contamination, however as noted above, analysis of sediment samples indicated no elevated contaminants above Cefas AL 1 (including at a sampling site within 3 km of the Wollaston gas field).



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Seabed Sediments

C01494-EGL3&4-GEO-003-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- 15 km Study Area

Seabed Sediment 250k

- 1.1.1 Mud
- 1.1.2 (gravelly) Mud
- 1.2.1 sandy Mud
- 1.2.2 (gravelly) sandy Mud
- 1.3.1 muddy Sand
- 1.3.2 (gravelly) muddy Sand
- 2.1.1 Sand
- 2.1.2 (gravelly) Sand
- 3.1.1 gravelly Sand
- 3.2.1 sandy Gravel
- 3.3.1 Gravel
- 4.1.1 gravelly Mud
- 4.2.1 muddy Gravel
- 4.3.1 gravelly muddy Sand
- 4.4.1 muddy sandy Gravel
- 5. Rock & boulders
- 6. No data at this level of Folk
- 9. Restricted data
- 10. Unpublic data

0 10 20 NM

0 25 50 KM

Date	08/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
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Authorised	J Drew-Murphy

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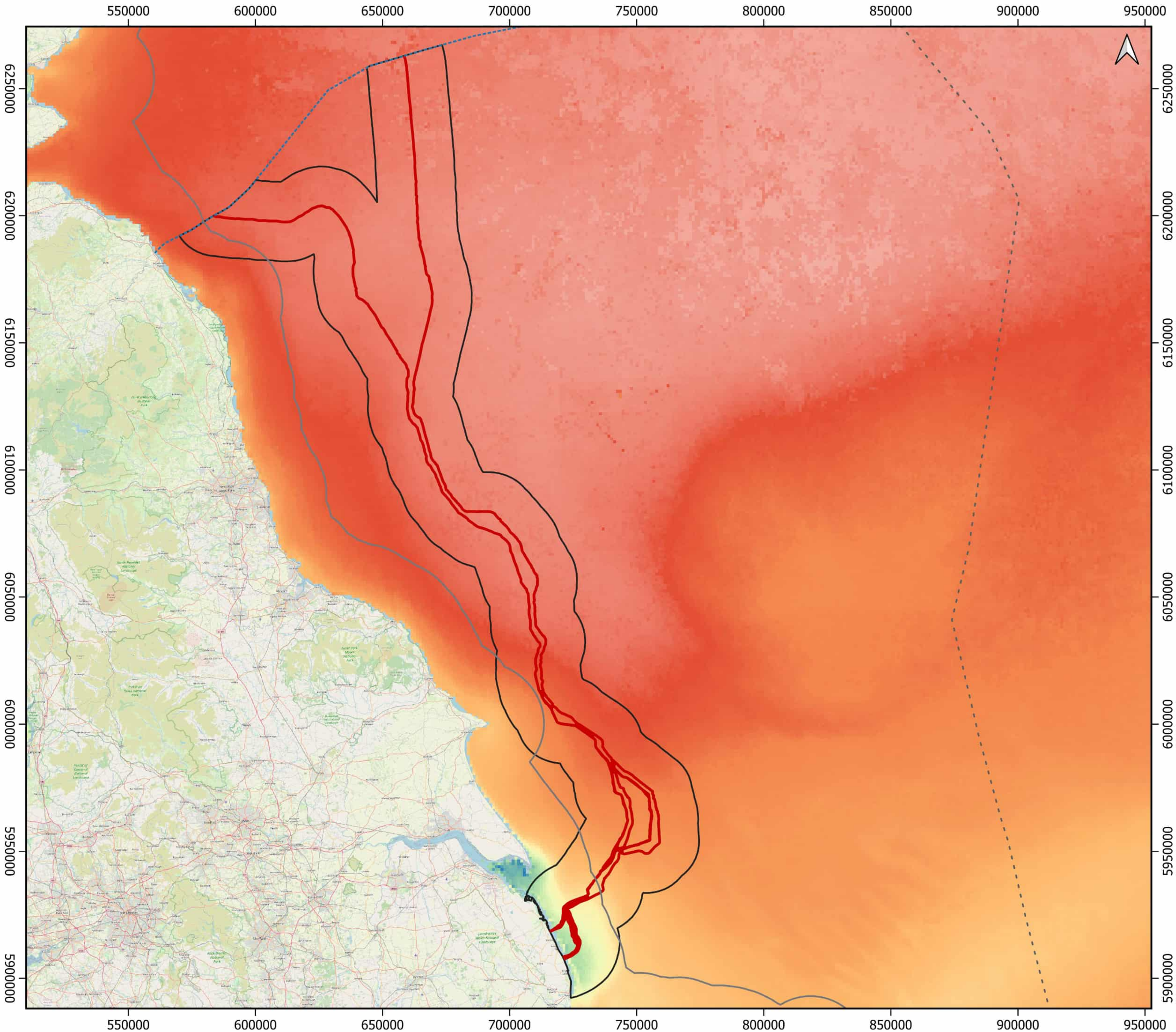

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Annual Mean Suspended Particulate Matter

C01494-EGL3&4-GEO-005-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- 15 km Study Area

SPM Mean (mg/l) (Cefas, 2016)

- 1
- 2
- 5
- 10
- 15
- 20
- 25
- 30
- 40
- 50
- 60

0 10 20 NM

0 25 50 KM

Date	08/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
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Unit	Meters
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Designated Sites

23.5.29 Designated sites in the Study Area which are of relevance to the marine physical processes topic are shown in Figure 23-6 (Drawing: C01494-EGL3&4-PROT-002) (JNCC, 2023).

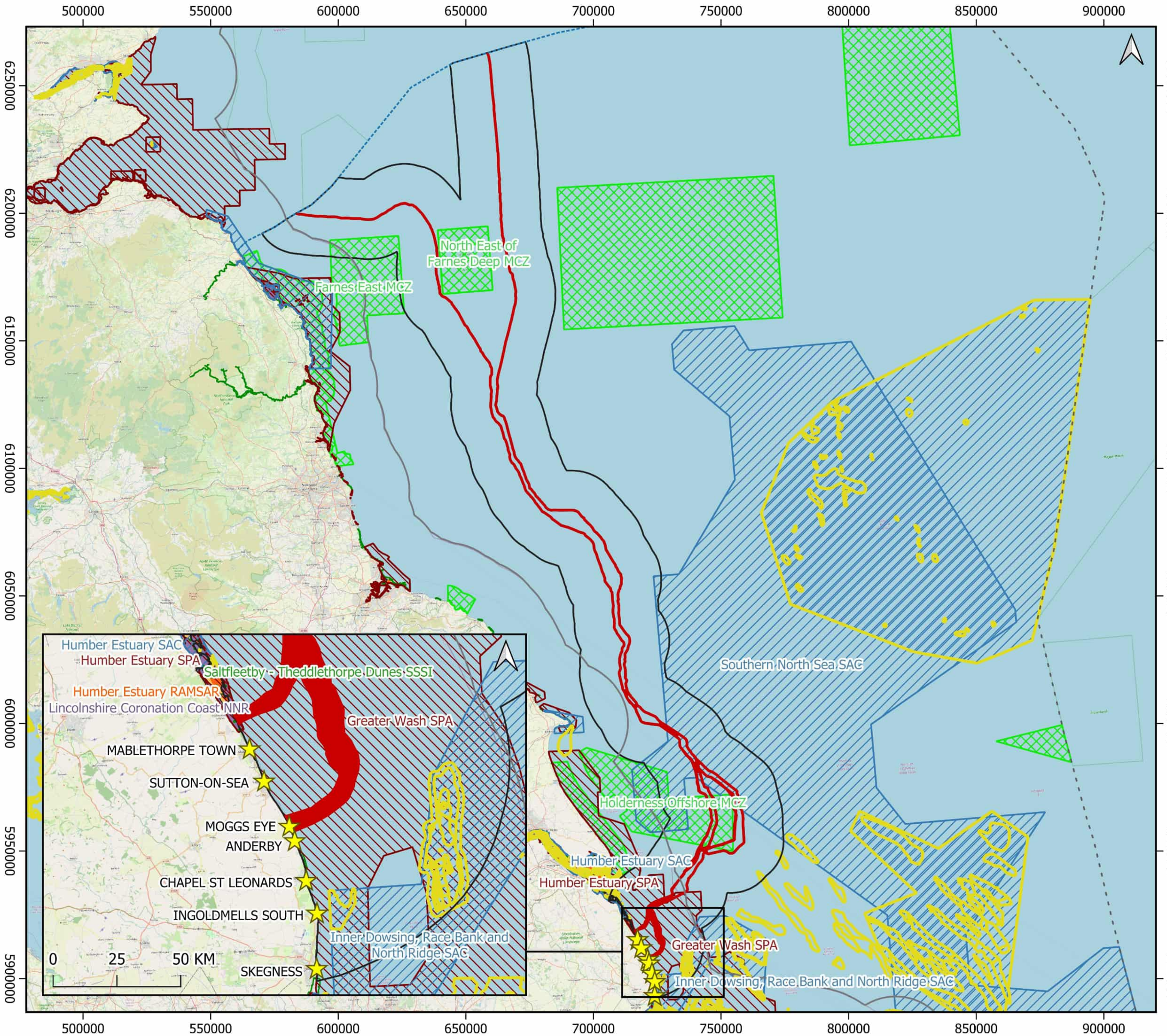
23.5.30 The Scoping Boundary passes through the following designated sites:

- Greater Wash SPA: which supports breeding and foraging areas for a large number of bird species. Specific marine habitats that provide supporting habitat to the designated features include intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef.
- Holderness Offshore MCZ: an area of mixed coarse sediment and sand, supporting habitats for a wide variety of species, such as, ocean quahog (*Arctica islandica*), crustaceans (crabs and shrimp), starfish and sponges. The site is also a spawning and nursing ground for a range of fish species; and also includes the northern tip of the Silver Pit North Sea glacial tunnel valley.
- Southern North Sea SAC: an area of importance for harbour porpoise (*Phocoena phocoena*). The mixed seabed of coarse and sandy sediments found here are an important physical characteristic, as these are preferred by harbour porpoise, due to availability of prey.
- Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC: an extensive and complex area which exhibits a range of dune types including shifting dunes, fixed dunes with herbaceous vegetation and dunes which supports sea-buckthorn *Hippophae rhamnoides.* The dune slacks at this site are part of a successional transition between a range of dune features, and some have developed from saltmarsh to freshwater habitats. Advice from Natural England states that the protected features of this SAC rely on sediment transport along the coast.

23.5.31 In addition, the following designated sites lie within the wider Study Area, but are avoided by the Scoping Boundary:

- Inner Dowsing, Race Bank and North Ridge SAC: a site characterised by sandbanks and biogenic reefs, protecting benthic communities & ecology.
- The North East of Farnes Deep HPMA and MCZ: characterised by predominantly sandy sediment, with patches of gravelly sand and mud. The site is important for its ‘mosaic of habitats’ supporting a diverse range of marine flora and fauna.
- Annex I Subtidal sand banks: there are a number of Annex I subtidal sand bank features which partially lie within the Study Area.

23.5.32 The Saltfleetby to Theddlethorpe Dunes SSSI also lies within the Study Area. The site is designated for important tidal sand and mudflats, marshes and sand dunes. The southern edge of this SSSI intersects with the Landfall option at Theddlethorpe.



Designated Sites and Bathing Waters within the Study Area

C01494-EGL3&4-PROT-002-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- Relevant Designated Sites Study Area
- Designated Bathing Waters
- Annex I Sandbank

Designated Sites

- Special Area of Conservation (SAC)
- Marine Conservation Zone (MCZ)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- RAMSAR Site

0 10 20 NM

0 25 50 KM

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23.6 Proposed Assessment Methodology

23.6.1 A more detailed literature review will be developed for the EIA to expand on the high-level overview provided within this chapter of the EIA Scoping Report. Project-specific survey data will be used to enhance the understanding of the baseline conditions, with a focus on geophysical, geotechnical and benthic survey data.

23.6.2 The additional data will be used to inform the CBRA and Burial Assessment Study (BAS) which will consider:

- micro-routeing;
- minimum burial depths;
- identification of potential burial tools and methods; and
- methods of cable protection where full cable burial cannot be achieved, or risk of subsequent cable exposure is high.

23.6.3 Existing studies from comparable projects (the 'Evidence Base') will be used to further inform the likely scale of any potential impacts.

23.6.4 The marine physical processes EIA will follow the general assessment approach outlined in Part 3, Chapter 21 (EIA Approach and Methodology) of this EIA Scoping Report. The assessment of potential effects will be established using the standard Source-Pathway-Receptor Approach.

23.6.5 The assessment of marine physical processes will follow the guidance documents listed below where they are specific to this topic:

- 'General advice on assessing potential impacts of and mitigation for human activities on Marine Conservation Zone (MCZ) features, using existing regulation and legislation' (JNCC and Natural England, 2011);
- 'OSPAR Assessment of the Environmental Impacts of Cables' (OSPAR, 2009);
- 'Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry'. Department for Business Enterprise and Regulatory Reform in association with Defra (BERR, 2008); and
- 'Advice Note Eighteen: The Water Framework Directive' (Planning Inspectorate, 2017).

23.6.6 The Study Area for the physical processes baseline within the EIA will be as currently outlined but will be further refined to focus on the final routes and may be further refined to consider the variation in tidal excursion within the Study Area. The scope of the marine physical processes assessment is to characterise the baseline physical processes within the Study Area and to consider the magnitude and duration of potential impacts of the Projects.

23.6.7 The assessment approach includes a range of desktop analyses and spreadsheet-based models and this will be supplemented by evidence from analogous assessments and monitoring data.

23.6.8 Currently both open cut trenching and trenchless construction techniques are proposed construction methods for the intertidal zones. For trenchless techniques (for example HDD), there will be no impact on the intertidal zone from construction activities. For open-cut trenching, a cofferdam may be required, and this could have an influence of along-shore sediment transport. A review of the baseline along-shore transport and associated drivers would be undertaken and used to qualify the potential for impact. Depending on the outcome of this qualitative assessment, numerical modelling tools may be applied to further quantify the potential impact.

23.6.9 Spreadsheet based models will be applied to assess the potential Suspended Sediment Concentration (SSC) and sedimentation associated with installation activities for a range of hydrodynamic conditions, sediment types and release rates to capture the impact (in terms of plume extent, concentration, duration of increases and extent and thickness of deposits on the seabed). The assessment will focus on the realistic worst case installation scenario. The available baseline information and planned geophysical, geomorphological and benthic surveys will provide the data inputs for this assessment. The effects will be assessed in terms of the difference caused relative to the normal range of natural occurrence and variability.

23.6.10 In view of the low percentage of fines present in the sediments and due to the large existing evidence base, which includes multiple similar assessments using numerical modelling tools to assess impacts from increased SSCs, no new numerical hydrodynamic modelling is presently considered to be required.

23.6.11 The assessment of construction/operational impacts from external cable protection measures will quantify the areas of impact and relative changes in water depth. This will be considered alongside baseline information, results from the benthic surveys and expert judgement to determine the likely impact on receptors. Coastal processes modelling may be undertaken to quantitatively determine impacts from the position of external cable protection associated with infrastructure crossings of Hornsea 1 & 2 and if selected, several gas pipelines in shallow water on the routes to the Anderby Creek Landfall. Modelling would consider the impacts of the Projects in combination with the existing Viking Link crossings and any other known developments. The scope of the modelling would be discussed with Cefas, NE and the EA.

23.6.12 A WFD assessment will be undertaken to assess the potential impacts of the Projects on water and sediment quality. It is proposed that the WFD assessment will be presented as a technical appendix, the results of which will be presented within the Marine Physical Processes chapter of the EIA. The assessment of water quality impacts will focus on the impact on turbidity using spreadsheet-based models.

23.7 Scope of Assessment

23.7.1 A range of potential impacts on marine physical processes have been identified which may occur during the installation, operation (including maintenance and repair), and decommissioning phases of the proposed Projects. The decision on whether an impact should be further assessed with the EIA is based on whether potentially significant impacts may arise. A summary of the proposed assessment scope is provided in Table 23-4.

23.7.2 A precautionary approach has been taken and where there is no strong evidence-based or the significance is uncertain at this stage the impact has been scoped ‘in’ to the EIA.

23.7.3 Marine physical processes are best described as pathways, rather than as receptors. While outputs from the marine physical processes assessments will be reported in a stand-alone EIA chapter, for the most part it is not practical for the outputs to be accompanied by statements of effect of significance. Instead, the information on changes to the marine physical processes pathways will be used to inform other EIA topic assessments found in Part 3 including:

- Chapter 24 – Intertidal and Subtidal Benthic Ecology;
- Chapter 25 – Fish and Shellfish Ecology;
- Chapter 26 – Intertidal and Offshore Ornithology;
- Chapter 27 – Marine Mammals and Marine Reptiles; and
- Chapter 29 – Commercial Fisheries.

23.7.4 The scoping of indirect impacts from the identified marine physical processes pathways will be assessed within the relevant topics.

23.7.5 The physical processes features which are considered as potential receptors will be guided by the tidal excursion and consideration of sediment transport and seabed movement and will include:

- The adjacent coastline, particularly at proposed Landfalls and in adjacent SSSIs (including Saltfleetby to Theddlethorpe Dunes SSSI);
- Nationally or internationally designated sites with seabed/sedimentary or geological interest features below MHWS; and
- Designated bathing waters.

Table 23-4: Scoping assessment of impacts on physical processes

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Disturbance of sub-tidal seabed morphology	Boulder clearance. Pre-sweeping Cable burial and trenching Deposit of external cable protection Trenchless solution exit pits or flotation pits	Seabed geomorphology Subtidal Benthic Habitats Fish and Shellfish Ornithology Commercial fisheries	IN – While seabed preparation and submarine cable installation activities have the potential to directly disturb the seabed morphology, the proposed submarine cable corridor has been routed to avoid seabed features such as sandbanks, sandwaves and notable bathymetric depressions. However, there remains the potential for some pre-sweeping and there is potential for the requirement for deposits of external cable protection in some areas.	OUT – If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. In these circumstances pre-sweeping may be required to expose the section of cable in need of repair.	IN – Although the significance of the effect of removing the cable during decommissioning is expected to be of similar or lower magnitude than construction, there is the potential for temporary increases in deposition of suspended sediments which could affect benthic habitats and species.
Disturbance of intertidal morphology	Cable burial and trenching Deposit of external cable protection Trenchless solution exit pits flotation pits.	Intertidal and coastal geomorphology	IN – At this stage of scoping no decision has been made on the installation technique to be used. As noted in the project description this may be either a trenchless technique or an open cut technique. The open cut trenching option may require a cofferdam which would pose a barrier along-shore coastal processes (although any effect would be short-lived) and as such this has been scoped in at this stage.	OUT – If the cable is installed correctly the potential for cable exposure due to any natural coastal retreat is minimal. The proposed Landfalls are sited in areas of either low erosion, net accretion or where coastal management practices are to hold the line.	IN – Although the significance of the effect of removing the cable during decommissioning is expected to be of similar or lower magnitude than construction, there is uncertainty over decommissioning techniques and associated potential impacts. As such, this aspect has been scoped in at this stage.
Temporary increase and deposition of suspended sediments	Boulder clearance, pre-lay grapnel runs/ Cable burial / trenching	Water quality Seabed substrates Subtidal Benthic Habitats	IN – Sediment suspended during installation of the submarine cable could result in temporary increases in SSC and subsequent deposition once material re-settles to the bed.	OUT - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. In the event that localised repair work is required,	OUT - It is expected that decommissioning activities will result in a lower magnitude effect than that

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
		Fish and Shellfish Ornithology Commercial shellfisheries		the significance of the effect will be of lower magnitude than during installation, being constrained to a smaller area.	already considered during construction.
Modifications to tidal and wave regimes and associated impacts to morphological features	Construction impacts, Presence of seabed cable protection,	Currents, water levels, waves bathymetry and seabed features.	IN – The Projects will have a narrow footprint in relation to the scale of physical processes driven by flow and wave action. Any effects will be highly localised and of a short duration. Scour/erosion may occur during construction; however, the Landfall works will be of a short duration, and localised. This aspect has been scoped in due to the potential impacts of open-cut trenching at the Landfall, which is still currently under consideration by NGET.	IN – Although NGET will design crossings with the recommendation that water depth is not reduced by more than 5%, it is unclear whether this recommendation can be met in all places. There is a concern that infrastructure crossings in shallow water could in combination with other projects effect wave regimes. Coastal processes modelling will be undertaken to inform the EIA	OUT - There will be short term, localised disruption of the tide, wave and sediment transport regime while the cables are removed. Any effects will be highly localised and of a short duration.
Release of contaminated sediments	Seabed activity such cable burial and trenching	Water quality Subtidal Benthic Habitats Fish and Shellfish Ornithology Commercial shellfisheries	IN – The temporary resuspension of contaminants in sediments has the potential to result in adverse effects on water quality. Although there are no records indicating the presence of contaminated sediments within the Study Area at levels requiring further investigation, and all sample records discussed above showed contaminant levels were below Cefas AL1, this aspect has been scoped in at this stage in order to include information on sediment quality and the potential for any impacts on water quality through increased SSC.	IN - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude than during construction.	IN – There will be short term disruption of the sediments while the cables are removed but the effect will be a lower rate of sediment disturbance than during construction.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Accidental releases or spills of materials or chemicals	Presence of project vessels and equipment	Water quality & sediment quality	OUT – Projects' vessels and contractors will 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 Shipboard oil pollution emergency plan (SOPEP). Compliance with Regulations will be sufficient to minimise the risk to the environment and no significant impacts are predicted.		
Temperature Increase	During the operation of a HVDC cable heat losses occur because of the resistance in the cable/conductor.	Sediment quality	OUT – not relevant to construction.	OUT - There are no specific regulatory limits applied to temperature changes in the seabed, although a 2°C change between seabed surface and 0.2 m depth is used as a guideline in Germany. Conservative calculations undertaken for Viking Link (which crosses German waters) concluded that heating in excess of 2 °C at 20 cm sediment depth will only occur if cables are bundled and buried to less than 0.75 m (National Grid and Energinet 2017). As yet, the full CBRA has not been carried out. Any temperature changes will be localised to the immediate environment surrounding the cable and undetectable against natural temperature fluctuations in the surrounding sediments and water column. No significant effects are predicted.	OUT – not relevant to decommissioning.

23.8 References

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24. Intertidal and Subtidal Benthic Ecology

24. Intertidal and Subtidal Benthic Ecology

24.1 Study Area Definition

24.1.1 This chapter of the EIA Scoping Report describes the potential impacts arising from the construction, operation and maintenance and decommissioning of the Projects on intertidal and subtidal benthic ecology receptors. Benthic receptors include the organisms living in (infauna) or on (epifauna) the seabed, excluding shellfish which are covered in Part 3, Chapter 25 – Fish and Shellfish, as well as their supporting habitats.

24.1.2 The Study Area for this receptor includes the Scoping Boundary plus an additional 15 km buffer to either side, representative of the maximum tidal excursion. This is consistent with the Marine Physical Processes chapter (Part 3, Chapter 23) and incorporates the area within which there is the potential for indirect impacts associated with the deposition of suspended sediments. The Study Area will be reviewed and refined for the EIA based on maximum tidal excursions and, if appropriate, sediment dispersion calculations. The zone of influence will be influenced by the conclusions of Part 3, Chapter 23 – Marine Physical Processes, and this chapter should be read in conjunction with these findings.

24.2 Data Sources

24.2.1 Data sources for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

24.2.2 Site-specific intertidal and subtidal benthic surveys will be carried out to supplement publicly available data sources to characterise the baseline environment and determine the presence of any features that may have conservation significance. A geophysical survey has been carried out, over an approximate 500 m wide area, along the length of the Scoping Boundary (including the Landfalls). In some areas this width increased to find alternative routes around features of interest. Preliminary interpretation of the geophysical data has been undertaken and environmental sampling stations have been selected based on this interpretation.

24.2.3 The survey methods took into consideration best practice guidance including Davies *et al.* (2001), Wyn *et al.* (2006), Saunders *et al.* (2011), Nobel-James *et al.* (2018), and NRW (2019).

24.2.4 The positioning of environmental grab sampling stations has been based on a flexible design - spacing interval has been informed by geophysical survey outputs as well as a review of publicly available data. Sampling stations have been positioned every 2 - 5 km inshore and 5 or 10 km offshore based on the review of the geophysical data. In areas which have been identified as potential herring or sandeel habitat additional grab sample locations have been identified to ensure sediment samples for particle size analysis are acquired every 2.5 km within these areas (spacing previously agreed with MMO and Cefas).

24.2.5 At each environmental grab station, two x dual van veen grabs (totalling four samples from two drop downs) will be acquired. From these samples, two will be retained for analysis (one for microbenthic faunal analysis and one for physio-chemical analysis) and two will be stored in case the first samples become compromised or additional analysis is required. In addition, camera transects will be completed at the stations using drop-down video. Additional video / camera transects will be completed to ground truth geophysical data e.g. where sediment changes are observed that could represent Annex 1 reef, or there is mottled or reflectivity variation in the sidescan sonar data. Through the Holderness Offshore MCZ camera transects will be taken every 500 m, with additional transects targeting the Silver Pit feature. The camera will be towed at a maximum of 1 knot above the seabed to ensure consistent footage. The footage will be the only source of ground-truthing in areas where a benthic grab has been unsuccessful.

24.2.6 The footage review will include observations such as substrate characterisation, evidence of benthic activity by organisms, identification of habitats and organisms, characterisation of aquatic vegetation and evidence of fishing activity.

24.2.7 Data will be used to produce intertidal and subtidal habitat maps. Faunal identification and quantification will be carried out on grab samples and still photographs to obtain species density data and percentage cover for colonial species.

24.2.8 Habitats will be identified to the lowest European Nature Information System (EUNIS) habitat classification possible. If a sensitive EC Habitats Directive Annex I listed habitat e.g., biogenic, stony or bedrock reef, etc., is identified the extent of the habitat within the survey area will be determined and consideration will be given to whether additional survey is required to avoid the habitat or further classify it.

24.2.9 A request for a Sample Plan was made to the MMO related to ensuring that sufficient data is acquired to inform the assessment of the impacts from pre-sweeping. The requirements stipulated in the sampling plan have been incorporated into the benthic sampling procedure.

24.2.10 A Phase 1 habitat walkover survey has been completed on the beach at both Landfalls as both open cut trenching and trenchless techniques are proposed methods of construction. Surveys were conducted in accordance with JNCCs Handbook for Phase 1 Habitat Survey. Habitat boundaries were located and recorded using a hand-held GPS accurate to 3 m. Digital photographs were taken to illustrate each habitat type identified. Ecological and physical changes in characteristics were noted to identify and delineate any features of conservation importance present.

24.2.11 A Phase 2 survey was also completed which involved taking a small number of sediment samples from the foreshore. These were sent for laboratory analysis to identify the benthic invertebrates present and characterise the sediment granulometry. Three samples were taken along three transects (nine samples in total), covering the low, mid and high shore over approximately a 500m wide corridor.

24.2.12 Relevant stakeholders such as MMO, NE, Cefas and the JNCC were consulted prior to the survey commencing. Stakeholder engagement will continue as survey results become available.

Publicly Available Data

24.2.13 Desk based review of publicly available data sources (literature and GIS mapping files) will be used to supplement the site-specific ecology surveys and describe the wider baseline environment. Table 24-1 lists the key data sources which would be used in the assessment.

Table 24-1: Key publicly available data sources for intertidal and subtidal benthic ecology

Data Source	Description
EMODnet (2021)	EUNIS 2019 habitat types. Habitat suitability model for *Sabellaria spinulosa* reefs in the UK
National Biodiversity Network (NBN) Atlas	Records for benthic species and habitats.
British Geological Survey (BGS) GeoIndex Offshore portal for marine habitats data	A range of marine geoscience data held within the National Geoscience Data Centre.
The Humber Regional Environmental Characterisation (REC) Study (2021)	A multidisciplinary study of the geology, biology, and archaeology of an 11,000 km² area off the east coast of England. https://nora.nerc.ac.uk/id/eprint/15037/1/OR10054.pdf
Magic Maps	An interactive mapping system developed by Defra that holds spatially referenced data on the natural environment for England.
JNCC	Marine Habitat data product: Habitats Directive Annex I marine habitats. JNCC Conservation Advice for Marine Protected Areas.
NE	Natural England Conservation Advice for Marine Protected Areas.
Inshore Fishing and Conservation Authorities (IFCAs)	Website with Information about fishing and the species in the different regional Eastern and Northeastern Inshore Fishing and Conservation Authorities.
BGS Marine Sediment Particle Size dataset sourced from the BGS GeoIndex Offshore porta	This is a national dataset providing full coverage of the benthic, subtidal and intertidal aspects of the Study Area.
UKSeaMap 2018	Broad-scale overview of the coverage of different physical seabed habitats in the UK.
OneBenthic portal run by OpenScience Cefas	Compilation of 33,198 macrofaunal samples from 2014-2016, 83% of which contain associated data on sediment particle size composition. Dataset covers large areas of the UK continental shelf and was funded by the aggregates industry. (OpenScience.Cefas, 2023).
Offshore Wind Farm and Interconnector Environmental Statements	Environmental Statements for OWF developments Ossian Offshore Wind Farm Outer Dowsing Offshore Windfarm

Data Source	Description
	Viking Link
DEFRA (2020)	Intertidal substrate foreshore data.
Environment Agency	Dataset on the intertidal invertebrate assemblages, size epifauna and the size distribution of intertidal sediments, collected to assess the impacts of beach nourishment within the Saltfleet to Gibraltar Point beach management scheme.

Additional Studies

Heat Study

24.2.14 During operation the Projects, cables generate heat through a process referred to as resistive heating. This is caused by energy loss as the electric current flows through the cables. Whilst the use of high voltages minimises this heat loss, where the power cables are buried the surrounding sediment may be heated, which could potentially effect species in the sediment. There is a negligible capability to heat the overlying water column due to the very high heat capacity of water.

24.2.15 To understand the potential effect of heat on sediments, heat calculations will be undertaken to determine the temperature distribution profile within the seabed. Calculations take into consideration factors such as cable length, voltage, maximum power, the HVDC configuration, depth of burial and the thermal resistivity of the sediments. The heat calculations will be used to inform the EIA.

Electromagnetic Field (EMF) Study

24.2.16 A study will be undertaken to calculate the predicted electromagnetic fields to be generated by the submarine power cables due to the electric current flowing along the cables. The electric and magnetic field strengths will be highest where the cables are separated and/or partially or unburied. The study will therefore focus on determining the maximum field strengths and the distance at which the fields dissipate to background values. This study will be used to determine the spatial extent over which electromagnetic changes could affect sensitive receptors.

24.3 Consultation

24.3.1 The scope of the Intertidal and Subtidal Benthic Ecology chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consents strategy. Table 24-2 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 24-2: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
Cefas	Consider that the following impact pathway should be scoped in: “Temporary habitat loss / seabed disturbance on subtidal broadscale habitats.”	Table 24-5 has been updated.

Organisation	Summary of response received	Action
	Consider that the extent of physical disturbance to the seabed for cables of this length is substantial and will affect a broad range of benthic habitats and species. This impact pathway should therefore be assessed in full, with data from the upcoming site-specific survey (and other relevant data sources highlighted by the applicant) used as the benthic ecology baseline against which impacts are assessed.	
	Consider that the following impact pathway should be scoped in: "Permanent habitat loss / seabed disturbance on subtidal broadscale habitats." The proposed cable routes pass through various sedimentary habitat types that would be permanently altered if cable protection is required, due directly to the material added to the seabed and also any associated scouring. Although such changes would likely be localised, they may cause impacts to regionally rare habitats, biotopes or species. This impact should therefore be assessed against the complete benthic ecology baseline, once available.	Table 24-5 has been updated.
	Consider that the following impact pathway should be scoped in: "Temporary increase and deposition of suspended sediments (due to trenching, boulder clearance etc.) on broadscale habitats and Annex I *Sabellaria spinulosa* reefs." Consider that substantial heavy deposition will occur within the vicinity of the cable route, and that therefore impacts should be assessed against the complete benthic ecology baseline for this area.	Table 24-5 has been updated.
	Consider that the following impact pathway should be scoped in: "Introduction or spread of marine non-native species (MINNS) on subtidal species." Agree that the measures proposed will minimise the risk of introducing MINNS, there is a risk that any cable protection that is required will provide hard surfaces that act as stepping stones to facilitate the spread of MINNS in the region. This is a particular concern in areas naturally dominated by soft sediments, as the introduced hard habitat could provide a new niche that increases connectivity with other natural or artificial habitats within the dispersal range of species. For the larvae of benthic invertebrate species, dispersal of tens of kilometres to more than a hundred kilometres are not unheard of. This potential impact pathway should therefore be scoped in and assessed.	Table 24-5 has been updated.
	Requested clarity on proposed benthic intertidal and subtidal sampling methods and the standards to be followed when generating sediment and faunal data from grab samples.	These aspects were discussed at a meeting with Cefas on 27 February 2024, where the proposed sampling strategy was confirmed, including the use of the Northeast Atlantic Marine Biological

Organisation	Summary of response received	Action
		Analytical Quality Control (NAMBAQC) scheme for data analysis.
NE	Consider that cable protection within benthic marine protected areas should be avoided. Where this is not possible, every effort should be made to mitigate the impacts.	This recommendation has been noted and is line with the NGETs design principles. Where the recommendation cannot be followed, robust justification will be provided and mitigation will be discussed with NE and JNCC.
	Consider that "Temporary increase and deposition of suspended sediments from boulder clearance, PLGR, pre-sweeping of sandwaves, cable burial and trenching, anchoring/jack-up foundations and deposit of external cable protection with regards to broadscale habitats and Annex I *Sabellaria spinulosa*" should be scoped in. These habitats, including Annex I *Sabellaria spinulosa* reef, have a medium sensitivity to heavy smothering.	Table 24-5 has been updated.
	Consider that "Temporary habitat loss / seabed disturbance on subtidal broadscale habitats during construction and operation" should be scoped in during construction and operation. Subtidal coarse sediments, sands and mixed sediment are all protected broad-scale features of the Holderness Offshore MCZ which support a wide range of infauna and have 'Recover' conservation objectives.	Table 24-5 has been updated.
	Consider that "Permanent habitat loss through external cable protection on subtidal broadscale habitats" should be scoped in. A cable route option passes through the Holderness Offshore MCZ, and it is considered that the use of cable protection hinders the 'Recover' conservation objectives of the protected broadscale habitat features.	Table 24-5 has been updated.
JNCC	Noted an inconsistency between the scoping out of impacts for fish and shellfish and benthic ecology. Recommended that for consistency EMF impacts on benthic receptors be scoped in, with reference to Ocean quahog.	MMO Scoping Opinion agreed that electromagnetic changes could be scoped out for benthic ecology receptors. Any impacts on shellfish receptors such as ocean quahog will be captured in the Fish and Shellfish Chapter. Table 24-5 has not been updated.
JNCC	Suggested the following is scoped in: Temporary habitat loss / seabed disturbance from; boulder clearance, PLGR, pre-sweeping of sand waves; cable burial and trenching; anchoring/jack-up foundations; and deposit of	Table 24-5 has been updated.

Organisation	Summary of response received	Action
	external cable protection with regards subtidal broadscale habitats. Permanent habitat loss from deposition of external cable protection with regards subtidal broadscale habitats. Temporary increase and deposition of suspended sediments from; boulder clearance, PLGR, pre-sweeping of sand waves; cable burial and trenching; anchoring/jack-up foundations; and deposit of external cable protection with regards broadscale habitats and Annex I Sabellaria spinulosa reefs	
MMO	MMO agrees that all benthic ecology receptors can be scoped out for 'underwater noise changes', 'electromagnetic changes', 'temperature increase', and 'accidental spills' for the reasons provided in the report.	Noted.

24.3.2 Further consultation to inform the PEIR will be undertaken with stakeholders to supplement the desktop review and studies. The following bodies will be consulted as a minimum to ensure that the most up-to-date information is collated:

- JNCC
- NE
- Cefas
- IFCAs: Eastern, North-Eastern and Northumberland.
- EA
- MMO

24.4 Baseline Characterisation

Introduction

24.4.1 This section provides a characterisation of the current baseline environment and describes the key intertidal and subtidal benthic ecology along the proposed submarine cable corridor. It also includes the designated sites and protected species within the Study Area.

Intertidal Zone

24.4.2 The definition of the intertidal zone is the area of seashore that is exposed at low tide and inundated at high tide (Marine Scotland, 2023). The Projects will Landfall at the Lincolnshire coast. A preferred Landfall site has not yet been selected and the EIA Scoping considers both Anderby Creek and Theddlethorpe.

24.4.3 At the proposed Anderby Creek Landfall the foreshore sediments are largely composed of littoral sand and moderate to high energy infralittoral coarse sediment (EMODnet, 2021).

24.4.4 At the proposed Theddlethorpe Landfall the foreshore sediments are also largely composed of sand. The available data indicates that the intertidal area is characterised by a moderate to high energy regime (EMODnet, 2021).

Subtidal Zone KP 0.45 – 3_KP 436 / 4_KP 422

24.4.5 The definition of subtidal zone is the area where the seabed is below the reach of the lowest spring tide.

24.4.6 As the English Offshore Scheme moves away from the Lincolnshire coast, the sediment changes from the moderate energy infralittoral seabed to EUNIS code A5.13 Infralittoral coarse sediment for approximately 0.17 km before changing to A5.14 Circalittoral Coarse sediment which remains the dominant substrate for the next 84 km except for small patches of A5.25 or A5.26 Circalittoral fine sand or Circalittoral muddy sand between 3_KP 11 and 3_KP 12 / 4_KP 11 and 4_KP 12. Coarse sediment habitats which are a combination of coarse sands, gravel and shingle are widespread across the southern North Sea (OESEA4, 2022). The heterogeneous substrates and high energy conditions associated with A5.14 Circalittoral coarse sediment tend to be characterised by robust polychaete worms such as *Lanice conchilega* and the calcareous tube-building *Spirobranchus triqueter,* mobile crustaceans (particularly amphipods such as *Ampelisca spinipes*) and the sea cucumber *Neopentadactyla mixta*. The lancelet (*Branchiostoma lanceolatum)* may also occur in this habitat.

24.4.7 Dependant on the final route design the Projects may also pass through areas of A5.25 or A5.26 Circalittoral fine sand or Circalittoral muddy sand which are characterised by sediments containing between 5% to 20% silt and a high proportion of clean sand. Faunal communities are usually richly supported by a diverse variety of polychaetes, bivalves such as white furrow shell (*Abra alba*) and shiny nut clam (*Nucula nitidosa*), and echinoderms such as brittle stars (*Amphiura spp*), serpent stars (*Ophiura spp*)., and sand stars (*Astropecten irregularis*).

24.4.8 The Scoping Boundary then passes through an area of A5.44 Circalittoral mixed sediment between 3_KP 57 and 3_KP 62.3 / 4_KP 56.5 and 4_KP 63.5. Due to the variable nature of this type of seabed, a diverse and wide range of species can be found including infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii*. Where harder substrate such as stones and shells are present, colonial hydroids including *Nemertesia* spp. and *Hydrallmania falcata* may become established.

24.4.9 Next, the Scoping Boundary passes through an area of A5.45 Deep circalittoral mixed sediments between 3_KP 65 and 3_KP 67.5 / 4_KP 65.3 and 4_KP 67.5, which is surrounded by a border of A5.15 Deep circalittoral coarse sediment. Substrates in A5.45 Deep circalittoral mixed sediment contain a mixture of slightly muddy mixed gravelly sand and stones/shell. Faunal communities are often highly diverse, containing a range of infaunal polychaete and bivalve species. A5.15 Deep circalittoral coarse sediment represents habitats with coarse sands and gravel/shell with diverse faunal communities. Settlement of juvenile horse mussel (*Modiolus modiolus)* may occur in this habitat and as such, large beds may occasionally be found in this habitat.

24.4.10 Following a small patch of A5.15 Deep circalittoral coarse sediment at 3_KP 67.5 and 4_KP 67.5, the habitats transition back into A5.14 Circalittoral coarse sediment until 3_KP 4 and 4_KP 80 where the substrate transitions back into A5.15. This remains the dominant habitat type until 3_KP 108.3 and 4_KP 108.4. This is except for a small patch of A5.27 Deep circalittoral sand from 4_KP 89.4 and 4_KP 90.7, and a small patch of A5.45 Deep circalittoral mixed sediments between 3_KP 97.3 and 3_KP 99.3. At 3_KP 108.3 and 4_KP 108.4, the Scoping Boundary passes into A5.27 Deep circalittoral sand. Approximately 280 km of the Scoping Boundary in relation to EGL 3 and 250 km of the Sopping Boundary in relation to EGL 4 passes through this habitat type. Due to depth and distance offshore, little data is available for this type of habitat. However, it is understood to be a more stable habitat than its shallower counterparts and is characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms. The remainder of the Scoping Boundary passes through A5.27 Deep circalittoral sand and A5.15 Deep circalittoral coarse sediment intermittently until 3_KP 436 and 4_KP 422 at the Scottish border.

24.4.11 Though the Scoping Boundary is not known to contain any areas of Annex I reef, it passes as close as 0.4 km to areas of Bedrock/stony reef. Stony reef, classified as A4.3 Atlantic and Mediterranean low energy circalittoral rock and A4.33 Faunal communities on deep low energy circalittoral rock, occurs on wave-sheltered circalittoral bedrock and boulders subject to mainly weak/very weak tidal streams. Communities identified within this habitat type are often dominated by encrusting red algae, brachiopods (*Neocrania anomala*), the ascidian *Ciona intestinalis* and the sea squirt *Ascidia mentula*.

24.4.12 The Scoping Boundary contains several areas of A5.15 Deep Circalittoral coarse sediment. These habitats of coarse sands and gravel or shell cover a wide area of the offshore continental shelf. Their species types can be characterised by robust infaunal polychaete and bivalve species. This habitat is suitable for settlement of horse mussel (*Modiolus modiolus*). Evidence of the presence of this species would be noted during the benthic survey.

24.4.13 The lists below summarise the habitat types present within the Scoping Boundary with reference to both Landfall options.

Anderby Creek – KP 0.4 to 3_KP 437 / 4_KP 422 (south to north)

- Moderate energy infralittoral seabed
- A.5.13 Infralittoral coarse sediment
- A5.14 Circalittoral coarse sediment
- A5.25 or A5.26 Circalittoral fine sand or Circalittoral muddy sand
- A5.44 Circalittoral mixed sediment
- A5.45 Deep circalittoral mixed sediments
- A5.15 Deep Circalittoral coarse sediment
- A5.27 Deep Circalittoral sand

Theddlethorpe T3_KP 0 to T3_KP 18 / T4_KP 0 to T4_KP 14 (south to north)

- Littoral sand (intertidal)
- High energy infralittoral seabed
- High energy circalittoral seabed
- A5.14 Circalittoral coarse sediment

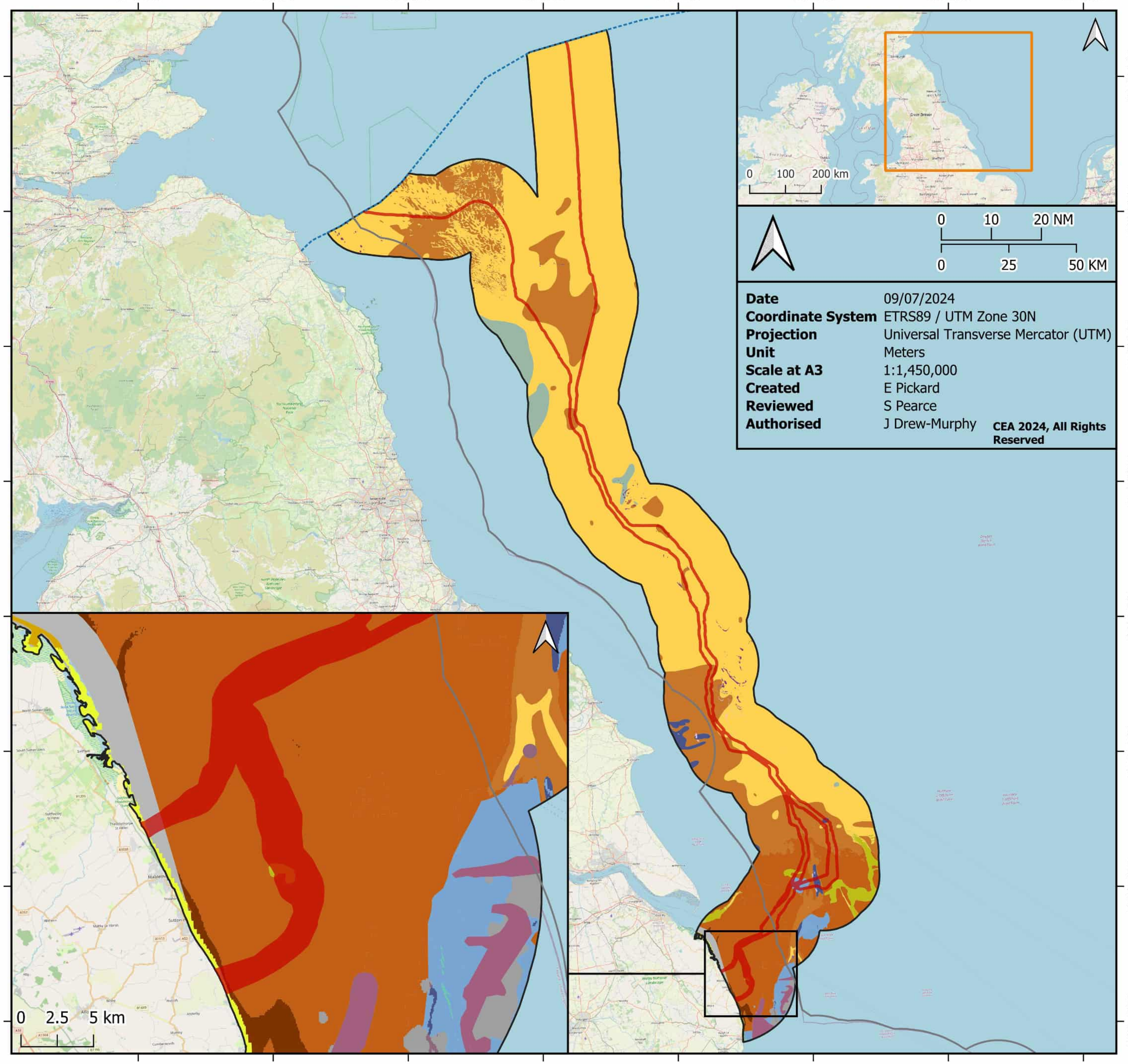
24.4.14 Table 24-3 provides descriptions for the broadscale habitats noted above as present within the Scoping Boundary. Figure 24-1, Drawing C01494-EGL3&4-PROT-003, illustrates the predicted intertidal and subtidal benthic ecology habitat types identified within the Study Area.

Table 24-3: Broadscale habitat descriptions within the Scoping Boundary

Broadscale habitat type	EUNIS habitat description
A5.13 Infralittoral coarse sediment	Moderately exposed habitats with coarse sand, gravelly sand, shingle and gravel in the infralittoral zone, are subject to disturbance by tidal steams and wave action. Such habitats found on the open coast or in tide-swept marine inlets are characterised by a robust habitat of infaunal polychaetes such as *Chaetozone setosa* and *Lanice conchilega*, *cumacean crustacea* such as *Iphinoe trispinosa* and *Diastylis bradyi,* and venerid bivalves. Habitats with the lancelet *Branchiostoma lanceolatum* may also occur.
A5.14 Circalittoral coarse sediment	Tide-swept circalittoral coarse sands, gravel and shingle generally in depths of over 15-20 m. This habitat may be found in tidal channels of marine inlets, along exposed coasts and offshore. This habitat, as with shallower coarse sediments, may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. *Neopentadactyla)* may also be prevalent in these areas along with the lancelet *Branchiostoma lanceolatum*.
A5.15 Deep Circalittoral coarse sediment	Offshore (deep) circalittoral habitats with coarse sands and gravel or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little quantitative data available. Such habitats are quite diverse compared to shallower versions of this habitat and generally characterised by robust infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore mixed sediments, and in some areas, the settlement of *Modiolus modiolus* larvae may occur and consequently these habitats may occasionally have large numbers of juvenile *M. modiolus*. In areas where the mussels reach maturity their byssus threads bind the sediment together, increasing stability and allowing an increased deposition of silt leading to the development of the biotope A5.622.
A5.25 or A5.26 Circalittoral fine sand or Circalittoral muddy sand	Clean fine sands with less than 5% silt/clay in deeper water, either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20 m. The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the pea urchin *Echinocyamus pusillus*), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community. Circalittoral non-cohesive muddy sands with the silt content of the substratum typically ranging from 5% to 20%. This habitat is generally found in water depths of over 15-20 m and supports animal-dominated communities characterised by a wide variety of polychaetes, bivalves such as *Abra alba* and *Nucula nitidosa,* and echinoderms such as *Amphiura spp* and *Ophiura spp*., and *Astropecten irregularis*. These circalittoral habitats tend to be more stable than their infralittoral counterparts and as such support a richer infaunal community.
A5.27 Deep Circalittoral sand	Offshore (deep) circalittoral habitats with fine sands or non-cohesive muddy sands. Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts and

Broadscale habitat type	EUNIS habitat description
	characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms.
A5.44 Circalittoral mixed sediment	Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20 m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii* are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as *Nemertesia spp* and *Hydrallmania falcata*. The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the A5.1. However, infaunal data for this habitat type is limited to that described under the biotope A5.443, and so are not representative of the infaunal component of this habitat type.
A5.45 Deep circalittoral mixed sediments	Offshore (deep) circalittoral habitats with slightly muddy mixed gravelly sand and stones or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little data available. Such habitats are often highly diverse with a high number of infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore gravels and coarse sands and in some areas, populations of the horse mussel *Modiolus modiolus* may develop in these habitats (see A5.622).

Source: EUNIS (2019)



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Intertidal and Subtidal Predicted Benthic Habitat Types

C01494-EGL3&4-PROT-003-B

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

12NM Limit
Scottish Adjacent Waters
Scoping Boundary
Benthic Study Area

Intertidal Zone Foreshore
Boulders / Loose Rock
Gravel
Made Ground
Mud
Mud & Gravel
Not Present
Rock Platform
Rock Platform with Banks of Gravel
Rock Platform with Boulders / Loose Rock
Sand
Sand & Gravel
Sand & Mud
Unspecified

EUSeaMap (2021) Habitat Types (EUNIS 2007 / Full-Detail Classification)
A3: Infralittoral rock and other hard substrata
A3.1: Atlantic and Mediterranean high energy infralittoral rock
A3.2: Atlantic and Mediterranean moderate energy infralittoral rock
A3.3: Atlantic and Mediterranean low energy infralittoral rock
A4: Circalittoral rock and other hard substrata
A4.1: Atlantic and Mediterranean high energy circalittoral rock
A4.2: Atlantic and Mediterranean moderate energy circalittoral rock
A4.27: Faunal communities on deep moderate energy circalittoral rock
A4.33: Faunal communities on deep low energy circalittoral rock
A5.13: Infralittoral coarse sediment
A5.14: Circalittoral coarse sediment
A5.15: Deep circalittoral coarse sediment
A5.23 or A5.24: Infralittoral fine sand or Infralittoral muddy sand
A5.25 or A5.26: Circalittoral fine sand or Circalittoral muddy sand
A5.27: Deep circalittoral sand
A5.35: Circalittoral sandy mud
A5.37: Deep circalittoral mud
A5.43: Infralittoral mixed sediments
A5.44: Circalittoral mixed sediments
A5.45: Deep circalittoral mixed sediments
A5.6: Sublittoral biogenic reefs
A5.61: Sublittoral polychaete worm reefs on sediment
A5.611: [Sabellaria spinulosa] on stable circalittoral mixed sediment
Na

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Export Date: 09/07/2024

Designated Sites within the Study Area

24.4.15 Table 24-4 presents the sites designated for benthic habitats and/or species within the Study Area, along with their protected features and conservation objectives. Distances to the Scoping Boundary at the nearest point to the English Offshore Scheme are given where appropriate. Designated sites are also illustrated in Part 3, Chapter 22 – Designated Sites in Figure 22-1, Drawing: C01494-EGL3&4-PROT-002.

Table 24-4: Sites designated for benthic habitats and species within the Study Area

Site Name and Code	Distance to Scoping Boundary (km)*	Relevant Annex I Protected Features	Conservation Objectives
Holderness Offshore MCZ (JNCC, 2021)	Within Scoping Boundary Overlaps the preferred route for: 1.2 km (in relation to EGL 3) 9.5 km (in relation to EGL 4) Overlaps the alternative route for: 21.1 km (in relation to EGL 3) 20.8 km (in relation to EGL 4)	• Overarching objective	The Conservation Objective for the Holderness Offshore Marine Conservation Zone is that the protected features: • so far as already in favourable condition, remain in such condition; and • so far as not already in favourable condition, be brought into such condition, and remain in such condition.
		• Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand	With respect to Subtidal coarse sediment, Subtidal sand and Subtidal mixed sediments within the Zone, this means that: i. its extent is stable or increasing; and ii. its structures and functions, its quality, and the composition of its characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or inhabiting that habitat) are such as to ensure that it remains in a condition which is healthy and not deteriorating. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.
		• North Sea glacial tunnel valleys (Silver Pit)	With respect to the North Sea glacial tunnel valleys within the Zone, this means that: i. its extent, component elements and integrity are maintained; ii. its structure and functioning are unimpaired; and iii. its surface remains sufficiently unobscured for the purposes of determining whether the conditions in paragraphs (i) and (ii) are satisfied. Any obscurement of that feature brought about entirely by natural processes is to be disregarded. Any alteration to that feature

Site Name and Code	Distance to Scoping Boundary (km)*	Relevant Annex I Protected Features	Conservation Objectives
			brought about entirely by natural processes is to be disregarded.
		• Ocean quahog (*Arctica islandica*) ***Species of Conservation Importance**	With respect to the Ocean quahog (*Arctica islandica*) within the Zone, this means that the quality and quantity of its habitat and the composition of its population in terms of number, age and sex ratio are such as to ensure that the population is maintained in numbers which enable it to thrive. Any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.
Farnes East MCZ (JNCC, 2021a)	6.6 km (in relation to EGL 4)	Moderate energy circalittoral rock: • Subtidal coarse sediment: • Subtidal sand: • Subtidal mud: • Subtidal mixed sediments: • Sea-pen and burrowing megafauna communities – **Feature of Conservation Importance**	The Conservation Objectives for the protected features of the MCZ are: Subject to natural change, the moderate energy circalittoral rock, subtidal coarse sediment, subtidal sand, subtidal mud, subtidal mixed sediments and sea-pen and burrowing megafauna community features are to remain in or be brought into favourable condition, such that their: • Extent is stable or increasing; and • Structures and functions, quality, and the composition of their characteristic biological communities are such as to ensure that they are in a condition which is healthy and not deteriorating
		• Ocean quahog (*Arctica islandica*) ***Species of Conservation Importance**	Subject to natural change, the ocean quahog feature is to remain in or be brought into favourable condition, such that: • The quality and extent of its habitat is stable or increasing; and • The population structure allows numbers to be maintained or increased.
North East of Farnes Deep HPMA	0.28 km (in relation to EGL 4) 4.9 km in relation to EGL 3)	• The marine ecosystem of the area	The Conservation Objective for the North East of Farnes Deep HPMA and MCZ is that the protected features: • so far as already in favourable condition, remain in such condition; and • so far as not already in favourable condition, be brought into such condition, and remain in such condition.

Site Name and Code	Distance to Scoping Boundary (km)*	Relevant Annex I Protected Features	Conservation Objectives
North East of Farnes Deep MCZ (JNCC, 2023)	0.28 km (in relation to EGL 4) 4.9 km in relation to EGL 3)	• Subtidal coarse sediment • Subtidal sand • Subtidal mixed sediments • Subtidal mud	With respect to Subtidal coarse sediment, Subtidal sand, Subtidal mixed sediments and Subtidal mud within the Zone, this means that: • Extent is stable or increasing; and • Structures and functions, quality, and the composition of characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or inhabiting each habitat) are such as to ensure that they remain in a condition which is healthy and not deteriorating. Any temporary deterioration in condition is to be disregarded if the habitats are sufficiently healthy and resilient to enable recovery. Any alteration to the features brought about entirely by natural processes is to be disregarded.
		• **Ocean quahog (*Arctica islandica*) *Species of Conservation Importance**	With respect to the Ocean quahog (*Arctica islandica*) within the site, this means that the quality and quantity of its habitat and the composition of its population in terms of number, age and sex ratio are such as to ensure that the population is maintained in numbers which enable it to thrive. Any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.
Humber Estuary SAC (UK0030170) (JNCC, 2023a)	4.1 km	• *1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)* • *1150 Coastal lagoons Priority Feature* • *2160 Dunes with Hippophae rhamnoides* • 2110 Embryonic shifting dunes • 1130 Estuaries • 1140 Mudflats and sandflats not covered by seawater at low tide • **2130 Fixed dunes with herbaceous vegetation (`grey dunes`) *Priority Feature**	With regard to the natural habitats and/or species for which the site has been designated (the ‘Qualifying Features’ listed below), and subject to natural change, ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status (FCS) of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species

Site Name and Code	Distance to Scoping Boundary (km)*	Relevant Annex I Protected Features	Conservation Objectives
		• 1310 Salicornia and other annuals colonising mud and sand • 1110 Sandbanks which are slightly covered by sea water all the time • 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes')	• The supporting processes on which qualifying natural habitats and habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site
Saltfleetby – Theddlethorpe Dunes and Gibraltar SAC (UK0030270) (JNCC, 2023b)	Within Scoping Boundary	• 2110. Embryonic shifting dunes • 2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram • **2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland *Priority** Species • 2160. Dunes with *Hippophae rhamnoides;* Dunes with sea-buckthorn • 2190. Humid dune slacks	With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change, ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring; • The extent and distribution of the qualifying natural habitats • The structure and function (including typical species) of the qualifying natural habitats, and, • The supporting processes on which the qualifying natural habitats rely
Inner Dowsing, Race Bank and North Ridge SAC (UK0030370) (JNCC, 2023c)	6.7 km	• 1170 Reefs • 1110 Sandbanks which are slightly covered by sea water all the time	To ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate and that it makes the best possible contribution to achieving the FCS 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

*This is the nearest distance to the combined Scoping Boundary, unless stated otherwise.

Protected Species and Priority Features within the Study Area

Sea-pen and burrowing megafauna communities

24.4.16 The Sea-pen and burrowing megafauna communities are a protected feature of the Farnes East MCZ.

24.4.17 Sea-pen and burrowing megafauna communities are associated with plains of fine mud and are found at water depths ranging from 15–200 m or more. Sediments are often heavily bioturbated by burrowing megafauna and as such, burrows and mounds may form a prominent feature of the sediment surface with conspicuous populations of sea-pens, typically the slender sea pen (*Virgularia mirabilis)* and phosphorescent sea pen (*Pennatula phosphorea*). Burrowing crustaceans present in this community may include Nephrops (*Norvegicus* spp.), shrimp (*Calocaris macandreae)* or ghost shrimp (*Palaemon paludosus*) (OSPAR, 2010).

Ocean quahog (Arctica islandica)

24.4.18 The ocean quahog is found around all British and Irish coasts, as well as offshore. The growth rate of quahog is rapid in juveniles but very slow and indeterminate in adults. Individual growth rates are highly variable between different regions in the North Atlantic, within sites, between seasons and daily, depending on temperature, salinity, hydrography and food supply. They are the longest-unitary species with the oldest recorded specimen found being 507 years old (MarLIN, 2023).

24.4.19 The ocean quahog is a burrowing species which has been found in a range of sediments, from coarse clean sand to muddy sand, in a range of depths typically from 4 m to 482 m deep. Ocean quahogs are thought to have a high sensitivity to physical loss of habitat, it is therefore important to conserve the extent and distribution of supporting habitats to provide the best chance of any potential settlement for new recruits and to retain existing individuals (JNCC, 2018).

24.4.20 The ocean quahog is a protected feature of the following designated sites within the Study Area:

- Holderness Offshore MCZ.
- North East of Farnes Deep HPMA and MCZ
- Farnes East MCZ

2130 – Fixed dunes with herbaceous vegetation (`grey dunes`) Priority Feature

24.4.21 Fixed dunes with herbaceous vegetation (“grey dunes”) are a protected feature of the following designated sites within the Study Area:

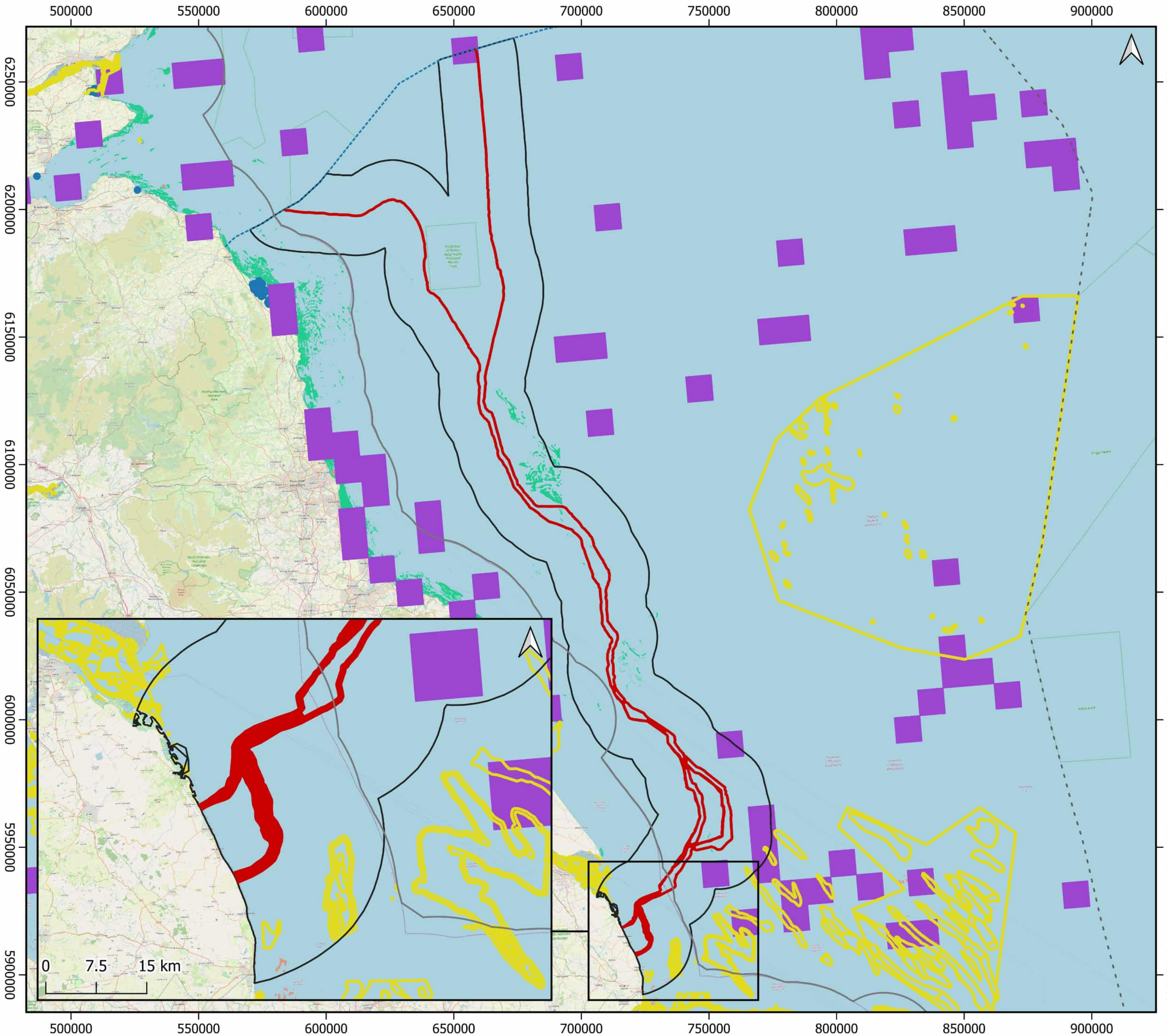
- Humber Estuary SAC
- Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC

24.4.22 This habitat is characterised by fixed dune vegetation occurring mainly on large dune systems. It typically occurs inland of the zone dominated by European marram grass (*Ammophila arenaria*) on coastal dunes and represents the vegetation that replaces marram as the dune stabilises and the organic content of the sand increases. In the UK the vegetation corresponds to the following National vegetation classification (NVC) types:

- SD7 European marram grass (*Ammophila arenaria*) – *Festuca rubra* semi-fixed dune community
- SD8 Red Fescue (*Festuca rubra*) – Lady's bedstraw (*Galium verum*) fixed dune grassland
- SD9b European marram grass– Tall oat grass (*Arrhenatherum elatius*) dune grassland, bloody cranes-bill (*Geranium sanguineum*) sub-community
- SD11 Sand Sedge (*Carex arenaria*) – Siny Iceland lichen (*Cornicularia aculeata*) dune community
- SD12 Sand Sedge – Sheep's fescue (*Festuca ovina*) – Common bent (*Agrostis capillaris)* dune grassland.

24.4.23 The herbaceous vegetation of fixed dunes in the UK exhibits considerable variation in type and characteristic. The most widespread type is Atlantic dune grassland, consisting of a short sward characterised by red fescue and lady's bedstraw and is typically rich in species of calcareous substrates. The vegetation shows considerable variation both from north to south and from east to west. In the south, several orchid species are found, including pyramidal orchid (*Anacamptis pyramidalis*), and a rich variety of other species. A taller type of dune grassland vegetation, in which bloody crane's-bill is prominent, is particularly characteristic of north-east England. In areas with a drier and more continental climate, such as Norfolk, and where the substrate is at the acidic end of the spectrum, the fixed dune vegetation is rich in lichens (JNCC, 2023d).

24.4.24 Figure 24-2 illustrates the ecologically sensitive sites and features within the Study Area (Drawing: C01494-EGL3&4-PROT-004).



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Relevant Sensitive Sites and Features within the Benthic Ecology Study Area

C01494-EGL3&4-PROT-004-B

0 100 200 km

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- Benthic Ecology Study Area
- Annex I Sandbank
- Ocean Quahog
- Seagrass Cover

Annex I Reef

- Bedrock
- Bedrock and/or Stony
- Biogenic
- Stony

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

Document Path: X:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3&4\06_PROT\C01494_EGL3&4_PROT_004.qgz

Export Date: 09/07/2024

24.5 Proposed Assessment Methodology

24.5.1 The intertidal and subtidal benthic ecology EIA will follow the assessment approach set out in Part 3, Chapter 21 of this EIA Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach.

24.5.2 Data derived from the site-specific surveys will provide a more detailed site characterisation and fill key data gaps such as habitat biotope maps; presence, extent and condition of sensitive habitats; and presence of protected species. The results from assessment undertaken to inform the marine physical processes chapter will be used to establish the potential impacts on intertidal and subtidal benthic receptors.

24.5.3 The following UK guidance is available and will be used to inform the assessment:

- Nature conservation considerations and environmental best practice for subsea cables for English Inshore and UK Offshore waters – Appendix 1 Benthic Characterisation (JNCC and Natural England, 2022).
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards (Parker *et al*., 2022).
- Sensitivity of features based upon the Marine Evidence-based Sensitivity Assessment (MarESA) framework where possible (MarLIN, 2021).
- The MarESA approach used by the Marine Life Information Network (MarLIN) (Tyler-Walters et al. 2018) which provides sensitivity reviews of species and habitats.

24.5.4 Where potentially significant impacts are identified, consultation will be undertaken with SNCBs to agree proportionate and effective mitigation, and residual effects will be presented.

24.6 Scope of Assessment

24.6.1 A range of potential impacts on intertidal and subtidal benthic ecology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 24-5 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage the impact has been scoped 'in' to the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped 'out' of the EIA.

Table 24-5: Scoping assessment of impacts on intertidal and subtidal benthic ecology

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Temporary habitat loss / seabed disturbance *(Abrasion / disturbance of the substrate on the surface of the seabed* *Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion)*	Trenchless solution and duct installation and open cut trenching at Landfall Cable burial and trenching.	Intertidal habitats	**IN –** At this stage of scoping no decision has been made on the installation technique to be used. As noted in the project description this may be either a trenchless technique or an open cut technique used. If an open cut technique is used it will cause temporary habitat loss and disturbance to the intertidal area and adjacent terrestrial habitats. Due to the potential disturbance this could cause it has been scoped in at this stage.	**OUT –** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. If the cable were to fail within the trenchless solution, there is no means of repairing it and a new duct would need to be drilled. This would be the subject of a separate Marine Licence. Therefore, impacts during operation and maintenance have been scoped out for the intertidal area.	**OUT** – It is likely that the cables duct would be left in place with no further impacts on the environment.
	Boulder clearance, PLGR, pre-sweeping of sand waves. Trenchless Solution and duct excavation. Cable burial and trenching. Anchoring/jack-up foundations. Deposit of external cable protection.	Subtidal – Broadscale habitats	**IN –** The significance of the effect will vary according to the techniques used during cable burial (e.g., jet or plough trenching) and the sensitivity of the habitat. The Study Area contains commonly occurring infralittoral and circalittoral habitats (e.g., A5.15, A5.27 and A5.45) that are widely distributed within the North Sea region. MarLIN sensitivity assessments for these habitats indicate that due to the burrowing life habitat of the dominant species the habitat has a low sensitivity to abrasion and penetration. This impact has been scoped in due to the area of potential impact over the length of the cable. Data from site-specific surveys will feed into the EIA.	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. If these circumstances arise the significance of the effect will be of lower magnitude that during construction. Data from site-specific surveys will feed into the EIA.	**IN -** The significance of the effect during decommissioning is expected to be of similar or of lower magnitude than construction. However, this aspect remains scoped in due to current uncertainty over methods likely to be used for decommissioning.
		Subtidal – Annex I habitats	**IN –** The results of the benthic and environmental surveys will determine if any Annex I habitats are present within the area of the Projects. Annex I habitats such as biogenic/geogenic reef, have the potential to be significantly affected by the installation of the cable as they typically have a higher sensitivity to abrasion and penetration and a lower resilience. The assessment will therefore focus on these habitats if they are found to be present.	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude that during construction. However, the effect could still potentially be significant if within an Annex I habitat.	**IN -** The significance of the effect during decommissioning is similar or of lower magnitude than construction. However, effects could potentially be significant if within an Annex I habitat.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Permanent habitat loss *(Physical change (to another seabed type or sediment type)* *Water flow (tidal current) changes including sediment transport considerations)*	Deposit of external cable protection.	Subtidal – Annex I habitats	**IN –** The extent of Annex I habitat within the North Sea is limited in relation to the wider broadscale habitats. Annex I habitats will have a high sensitivity to the impact pathway due to the potential for reclassification of the habitat type. Given the limited extent of such habitats the change in seabed type can have significant effects with regards the function of a designated site, or the extent of habitat within UK waters. The results of the benthic and environmental surveys will determine if any Annex I habitats are present within the area of the Projects and the assessment will focus on these habitats if they are found to be present.	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during construction. However, the effect could still potentially be significant if within an Annex I habitat.	**IN –** Scoped in due to current uncertainty over methods likely to be used for decommissioning and their potential impacts.
		Subtidal – Broadscale habitats	**IN –** The presence of the deposit of external cable protection has the potential to change the seabed type. They also have the potential to very locally alter sediment transport, creating scour pits or causing accretion. This may alter the benthic habitats either directly through a change in the substrate (e.g., sand to rock) or indirectly because of changes to local hydrodynamic conditions (e.g., increased risk of scour). The significance of the effect will vary according to the sensitivity of the habitat and the spatial extent of the deposits. The Study Area contains commonly occurring infralittoral and circalittoral habitats (e.g., A5.15, A5.27 and A5.45) that are widely distributed within the North Sea region. Although MarLIN sensitivity assessments identify that the habitats have high sensitivity to this pressure, the deposits will be extremely localised in relation to the wide extent of the habitat. Using the benthic and environmental survey data and engineering studies, the environmental assessment will identify the habitats that will be affected by deposits. This aspect has been scoped into the assessment to enable the comparison of site-specific data to the baseline benthic environment.	**IN –** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that remedial external cable protection may be required. Although MarLIN sensitivity assessments identify that the habitats have high sensitivity to this pressure, the deposits will be extremely localised in relation to the wide extent of the habitat. Where the habitats are not protected and are not This aspect has been scoped into the assessment to enable the comparison of site-specific data to the baseline benthic environment.	**IN –** During decommissioning no new seabed deposits will be made. There will therefore be no further permanent changes to the seabed. This aspect has been scoped into the assessment to enable the comparison of site-specific data to the baseline benthic environment.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Boulder clearance, PLGR. Trenchless solution and duct excavation. Cable burial and trenching. Anchoring / jack-up foundations. Deposit of external cable protection.	Broadscale habitats Annex I *Sabellaria spinuolsa* reefs	**IN –** Sediment suspended by interactions with the seabed will temporarily increase turbidity before being rapidly dispersed through natural hydrodynamic processes. Other developments in the vicinity of the Projects reported sediments contaminated with heavy metals, polychlorinated biphenyls (PCBs) and PAHs (GEOxyz, 2022), but analysis against OSPAR guidelines concluded that they were considered to be of no concern. Indirect effects from the mobilisation of contaminants entering the food chain are not predicted to be significant. The broadscale habitats identified in the Study Area are dominated by burrowing infauna which would not be affected by a change in water clarity. The benchmark used by NE for the pressure is a change in one rank e.g., from clear to intermediate, on the Water Framework Directive scale for one year. While trenching is undertaken a sediment plume will be generated continuously, but it will move with the location of the cable spread. Sands and gravels do not form part of the sediment load and will settle out of suspension quickly. MarLIN categorise light smothering as the deposition of up to 5cm of sediment in a discrete event. Light smothering will occur from several of the Projects' activities. The most significant contributor (relatively) will be from the sediment plume generated by cable trenching. Modelling undertaken for other cable projects (e.g., Viking Link reported in Intertek 2017 GridLink 2020, BERR 2008) indicates that approximately 90% of the suspended sediment is re-deposited within close proximity (<100 m) and would be classed as heavy smothering. The remaining 10% is transported over a wide area, which depending on the strength of the prevailing currents could be as far as 10-15 km, but will be deposited in thicknesses of less than 2 mm. This is within the range of natural variability associated with sediment transport in the region. The modelling also concludes that regardless of the	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during construction, however due to the potential for smothering of sensitive habitats during such activities, this aspect has been scoped in.	**IN -** The significance of the effect during decommissioning is similar or of lower magnitude than construction, however due to the potential for smothering of sensitive habitats during such activities, this aspect has been scoped in.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
			position along a cable route, the sediment plume generated is aligned with the dominant tidal axis. Material is deposited primarily along the dominant tidal axis but with some lateral extension. Over most of the plume the increase in suspended sediment concentrations is generally lower than 30 mg/l with natural conditions returning within a single tidal cycle following the cessation of activities, although if very fine chalk particles are present this could be extended to 4-5 days. Overall, the change in water clarity is not significant and generally in line with changes experience during storm conditions when background concentrations can reach 1000 mg/l. Benthic communities most sensitive to light smothering will be Annex I reef habitat (e.g., *Sabellaria spinulosa* reef, horse and blue mussel beds). *Sabellaria spinulosa* are not sensitive to the impact pathway (Tillin et al. 2022), requiring some degree of sediment transport for tube-building and feeding. Mussel beds are discussed separately below. No significant effects are predicted from light smothering on most benthic habitat types, however this aspect has been scoped in for the construction phase to enable the inclusion of information on sediment quality and potential for any effects on water quality through suspension of contaminated sediments, with impacts assessed against the complete benthic ecology baseline for the area.		
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)*	Boulder clearance, PLGR. Trenchless Solution and duct excavation. Cable burial and trenching. Anchoring / jack-up foundations.	Annex I *Modiolus modiolus* and *Mytils edulis* beds	**IN -** *Modiolus modiolus* (horse mussel) are unable to actively emerge from sediments if buried. If the deposition of fine sediment is not removed by currents/tidal flow, then mortality can occur. Experiments have shown that light smothering for longer than 8 days can lead to significant mortality (Tillin 2016). *Mytilus edulis* (blue mussel) are more resistant to high levels of suspended material and are able to move up through deposited sediments. However,	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. This impact pathway cannot be scoped out of the assessment for this habitat type until the ecological surveys have confirmed the absence of blue/horse	**IN -** The significance of the effect during decommissioning is similar or of lower magnitude than construction. This pressure cannot be scoped out of the assessment for this habitat type until the ecological surveys have confirmed the

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Smothering and siltation rate changes *Hydrocarbon & PAH contamination)*	Deposit of external cable protection.		mortality will depend on the duration of smothering. This impact pathway pressure cannot be scoped out of the assessment for this habitat type until the benthic and environmental surveys have confirmed the absence of blue/horse mussel beds within or in proximity to the Projects.	mussel beds in or within proximity of the Projects.	absence of blue/horse mussel beds in or within proximity of the Projects.
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Pre-sweeping	Subtidal habitats	**IN –** Pre-sweeping of sand waves involves the re-positioning of large quantities of sediment from the cable route to either immediately alongside the cable route, or to a separate disposal location. Depending on the technique used and the size of sand waves requiring pre-sweeping, the redeposition of sediment can cause smothering >10 cm deep over relatively wide areas of seabed (in the order of tens of thousands square metres). Effects could also potentially be significant if the disposal site contains sensitive habitats. The impact pathway cannot be scoped out until further information is available on the habitats present and the areas that will require pre-sweeping.	**OUT –** Pre-sweeping is used during construction to ensure that the cables are buried below the base of mobile sediments. Generally during operation, remedial works are focused on protecting sections of cable that have become exposed due to sediment mobility, or to repair cables that have been damaged by a third party (e.g., fishing damage). Pre-sweeping would not be required during a cable repair for third-party damage as the cable would already be exposed on the seabed. Therefore, the only scenario pre-sweeping might be required is where the cable has been damaged during construction and develops a fault in an area where pre-sweeping was used during construction. In this scenario the significance of the effect will be of lower magnitude than during construction and has therefore been scoped out of the assessment.	**IN –** Controlled flow excavation could be used during decommissioning to expose the buried cable. The significance of the effect during decommissioning is similar or of lower magnitude than construction. However, effects could potentially be significant if within a sensitive habitat.
Underwater noise changes	Geophysical survey. Presence of project vessels and equipment.	Subtidal species	**OUT –** Most research into the effects of underwater sound has focused on mortality, acute physiological effects or species interactions in species such as fish and marine mammals. There is relatively little evidence on the effects on sediment-dwelling invertebrates although it is thought that chronic exposure could lead to changes in the way in which a species contributes to ecosystem processes such as carbon storage or nutrient cycling (Solan *et al* 2016).	**OUT -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during construction and has therefore	**OUT -** The significance of the effect during decommissioning is similar or of lower magnitude than construction and has therefore been scoped out of the assessment for the same reasons.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
			The Projects will be a one-off event set against a background of existing anthropogenic noise. Any effects will be localised and short-term and are not predicted to be significant.	been scoped out of the assessment for the same reasons.	
Introduction or spread of marine invasive non-native species (MINNS)	Presence of project vessels and equipment. Deposit of external cable protection.	Subtidal species	**IN –** Although the introduction of the Projects' vessels, equipment, and external cable protection have the potential to bring in and spread MINNS all relevant guidelines will be followed (GB Non-native Species Secretariat, 2015) including vessel cleaning facilities and the use of anti-fouling paint. Projects vessels' and contractors will comply with the International Convention for the Control and Management of Ships' Ballast water and Sediments. All seabed deposits will be inert with no biologically active material. Project vessels will complete a biosecurity risk assessment prior to arriving on site which will include factors such as origins of the vessels and ensuring that relevant equipment is cleaned before use. Compliance with Regulations should be sufficient to minimise the risk to the environment, however there is still the potential for external cable protection to provide hard substrates that could act as 'stepping stones' to facilitate the spread of MINNS in the region. Therefore, this aspect has been scoped in at this stage.		
Electromagnetic changes /Barrier to species movement	Presence of cables	Subtidal species	N/A	**OUT -** Benthic communities are typified by sessile or low mobility species, which are unlikely to navigate using magnetic fields or have electroreceptors. At present there is very little research data available on this subject, however a recent study of polychaete *Hediste diversicolor* and EMF concluded that the species probably was unable to gather any directional information from the factor and therefore did not perceive it as a stressor (Jakubowska et al., 2019). Although some species of mollusc and crustacean are believed to be magnetically sensitive these are discussed within the shellfish and fish topic chapter.	N/A
Temperature increase	Presence of cables	Subtidal habitats and species	N/A	**OUT –** During the operation of an HVDC cable heat losses occur because of the resistance in the cable/conductor. This can cause localised heating of the surrounding environment (i.e., sediment for buried cables, or water in the interstitial spaces of external cable protection). There are no specific regulatory limits applied to temperature	N/A

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
				changes in the seabed, although a 2°C change between seabed surface and 0.2 m depth is used as a guideline in Germany. Conservative calculations undertaken for Viking Link (which crosses German waters) concluded that heating in excess of 2°C at 20 cm sediment depth will only occur if cables are bundled and buried to less than 0.75 m (National Grid and Energinet 2017). Any temperature changes will be localised to the immediate environment surrounding the cable and undetectable against natural temperature fluctuations in the surrounding sediments and water column. No significant effects are predicted. This pressure has therefore been scoped out of the assessment.	
Accidental spills *(Hydrocarbon & PAH contamination)*	Presence of project vessels and equipment	Intertidal and Subtidal habitats	**OUT –** Projects' vessels and contractors will 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 Shipboard Oil Pollution Emergency Plan (SOPEP). Compliance with Regulations will be sufficient to minimise the risk to the environment.		

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25. Fish and Shellfish

25. Fish and Shellfish

25.1 Study Area Definition

25.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Projects on fish and shellfish. Fish and shellfish receptors include marine species, diadromous species (species which migrate between freshwater and marine environments), elasmobranchs (sharks, rays and skates), and shellfish (crustaceans and molluscs).

25.1.2 The Study Area for this receptor includes the Scoping boundary plus an additional 15 km each side. This is a precautionary maximum zone of influence that encompasses the potential impact pathways from underwater noise and increased suspended sediment concentrations. It will be reviewed and refined for the EIA based on maximum tidal excursions and, if appropriate, sediment dispersion modelling. The zone of influence will be influenced by the conclusions of Part 3, Chapter 23 – Marine Physical Processes, and this chapter should be read in conjunction with these findings.

25.2 Data Sources

25.2.1 Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

25.2.2 Extensive contemporary and historic information is available regarding fish and shellfish ecology of the North Sea. Following a detailed review to inform the scope of the data and assessment, as presented, no site-specific surveys are planned for this topic, however data from the benthic survey may provide useful data for the assessment.

Publicly Available Data

25.2.3 Desk based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Table 25-1 lists the key data sources which will be used in the assessment.

Table 25-1: Key publicly available data sources for fish and shellfish

Data Source	Description
Environment Agency	Transitional and Coastal Waters (TraC) Fish Monitoring Programme
Department of Energy & Climate Change (DECC, 2022)	Offshore Energy Strategic Environmental Assessment 4 (OESEA4)

Data Source	Description
Coull *et al.* (1998), Ellis *et al.* (2012)	Fish Sensitivity Maps showing spawning and nursery grounds of selected fish species in UK waters
International Council for the Exploration of the Sea (ICES)	International Herring Larvae Surveys (IHLS) and international research reports and publications ICES Scientific Reports
Marine Space (2013)	Environmental Effect Pathways between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Habitat: Regional Cumulative Impact Assessments. Version 1.0. A report for the British Marine Aggregates Producers Association
Kyle-Henney *et al.* (2024)	MarineSpace report: Identifying and Mapping Atlantic Herring Potential Spawning Habitat: An Updated Method Statement.
Reach *et al.* (2024)	MarineSpace report: Identifying and Mapping Sandeel Potential Supporting Habitat: An Updated Method Statement.
Inshore Fishing and Conservation Authority	Website with Information about fishing and the species in the different regional Inshore Fishing and Conservation Authorities
FishBase	Species reference website www.fishbase.org
EMODnet	Interactive reference website which shows fish abundance and distribution. http://www.emodnet.eu/biology
Marine Management Organisation (MMO 2022)	UK Sea Fisheries annual statistics report 2021 and accompanying datasets which includes species catch list for the relevant ICES rectangles. https://assets.publishing.service.gov.uk/media/6512f96df6746b0012a4ba77/UK_Sea_Fisheries_Statistics_2022_.pdf
International Convention for the Conservation of Nature (IUCN)	The IUCN Red List of Threatened Species (https://www.iucnredlist.org/)
Brown & May Marine Ltd (2023)	Eastern Green Link Three and Four Transmission Reinforcement Cable Projects: Fishing Activity Report
Environment Agency	Ecology and Fish Data Explorer. Freshwater fish survey data, used to check presence or absence of migratory fish in catchments and estuaries EA Ecology & Fish Data Explorer
JNCC	Species specific data, of native species of conservation interest UK BAP List of UK Priority Species | JNCC Resource Hub
British Geological Society	Marine Sediment Particle Size dataset sourced from the BGS GeoIndex Offshore portal GeoIndex Offshore | BGS
Eaton *et al.* (2003)	Article published in the journal Fisheries Research summarising results of edible crab *Cancer pagurus* larvae surveys undertaken along the English east coast to inform species distribution.

Data Source	Description
Tallack (2007)	Article published in the Journal of the Marine Biological Association of the United Kingdom assessing the seasonality of the reproductive cycle for edible crab in the Shetland Islands, Scotland.
FishSource (2023)	Summary of the distribution of the Norway lobster *Nephrops norvegicus* in the Farn Deeps fishery within the North Sea.

Additional Studies

Commercial Fishing Activity Study

25.2.4 A fishing activity study was undertaken by Brown & May Marine Ltd. in March 2023 to understand the spatial and temporal distribution of fishing activity within the Study Area. This is described in further detail in Part 3, Chapter 29 - Commercial Fisheries. Landing data from this study which outlines target species and location of key fisheries areas will be used to inform the baseline for fish and shellfish.

Herring and Sandeel Assessment

25.2.5 Atlantic herring (*Clupea harengus*) and Sandeel (*Ammodytes spp.*) have specific habitat preferences that limit the spatial extent of spawning. As primary prey species for higher trophic levels, it is important to understand whether there is primary habitat within the Study Area which could be utilised by the species for activities such as spawning[2], feeding or resting. A desk-based assessment was undertaken to inform the position of grab samples, which are to be taken every 2.5 km within areas identified as potentially suitable habitat for herring and sandeel, as agreed with Cefas. The herring and sandeel assessment will be based on a review of particle size analysis to be carried out on the grab samples and additional vibrocores acquired in the Study Area. This will be supplemented with a desk-based literature review, e.g., a minimum of 10 years' worth of IHLS data. The assessment will follow the EIA methodology in conjunction with the approaches developed by MarineSpace (Kyle-Henney *et al.* (2024); Reach *et al* (2024) to assess effects on sandeel and Atlantic herring.

Fisheries Liaison and Mitigation Action Plan (FLMAP)

25.2.6 A Fisheries Liaison and Mitigation Action Plan will be produced to outline how the applicant will interact with all the legitimate sea users prior to and during any works on the Projects. This will be written by the FLO for the Projects.

Heat Study

25.2.7 During operation the Projects, cables generate heat through a process referred to as resistive heating. This is caused by energy loss as the electric current flows through the cables. Whilst the use of high voltages minimises this heat loss, where the power cables are buried, the surrounding sediment may be heated, which could potentially affect species in the sediment. There is a negligible capability to heat the overlying water column due to the very high heat capacity of water.

[2] When fish release or deposit eggs.

25.2.8 To understand the potential effect of heat on sediments, heat calculations will be undertaken to determine the temperature distribution profile within the seabed. Calculations take into consideration factors such as cable length, voltage, maximum power, the HVDC configuration, depth of burial and the thermal resistivity of the sediments. The heat calculations will be used to inform the EIA.

Electromagnetic Field (EMF) Study

25.2.9 Species such as elasmobranchs are known to be particularly sensitive to anthropogenically-induced EMFs. A study will be undertaken to calculate the predicted electromagnetic fields to be generated by the submarine power cables due to the electric current flowing along the cables. The electric and magnetic field strengths will be highest where the cables are separated and/or partially or unburied. The study will therefore focus on determining the maximum field strengths and the distance at which the fields dissipate to background values. This study will be used to determine the spatial extent over which electromagnetic changes could affect sensitive receptors.

25.3 Consultation

25.3.1 The scope of the fish and shellfish chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 25-2 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 25-2: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
MMO	Requested that the impacts of spawning and overwintering for both Edible crab and Lobster both species are to be considered.	Edible crab and Lobster have been considered in Section 25.4.1.6 using the following references: Eaton et al., 2003; Tallack, 2007; FishSource, 2023.
Cefas	Fish species with a demersal life stage should be scoped into the assessment of impacts from temporary habitat loss / seabed disturbance during all phases of the development, whereas entirely pelagic species should be scoped out.	Table 25-9 has been updated.
Cefas	Fish species with demersal life stage scoped into the assessment of impacts from permanent habitat loss at the construction and operation phase. Unless assurances can be provided that all cable protection will be removed at the end of the project lifetime, MMO recommends fish with demersal life stage are also scoped into the assessment for decommissioning stage.	Table 25-9 has been updated.
Cefas	Herring should be scoped in at construction and decommissioning phase of the assessment of impacts from temporary increase and deposition	Table 25-9 has been updated.

Organisation	Summary of response received	Action
	of suspended sediments from pre-sweeping due to potential smothering of eggs and newly hatched larvae.	
Cefas	Temperature changes should be scoped in during operation due to potential heating in areas of sandeel and herring spawning habitats as the cable burial risk assessment has not yet been completed.	Table 25-9 has been updated. NGET will undertake heat calculations to inform the EIA.
Cefas	Various comments were noted regarding inaccuracies in what is name Table 25-8 related to the spawning seasons for species.	Table 25-8 has been updated to reflect the necessary changes.
Cefas	The Latin name for river lamprey is given as '*Lampetra fluviatilistwaite*'. This should be corrected to lampetra *fluviatilis*.	This has been corrected.
Cefas	It should be noted that there are no recent confirmed records of common smooth-hound (*Mustelus mustelus*) being captured in UK waters. A genetic study (Farrell et al., 2009) confirmed that all specimens investigated were found to be starry smooth-hounds (*Mustelus asterias*).	Section 25.4.1.5 and Table 25-4 has been updated.
Cefas	Common skate (*Dipturus batis*) is now considered to be two species; blue skate (*Dipturus flossada*) and flapper skate (*Dipturus intermedia*).	Section 25.4.1.5 and Table 25-4 have been updated.
NE	The Tweed Estuary SAC should be scoped in for assessment.	Section 25.4.2.2 has been updated to consider the Tweed Estuary SAC.

25.3.2 Further consultation to inform the PIER will be undertaken with fisheries stakeholders to supplement the desk-top review and studies. The following bodies are being consulted to ensure that the most up-to-date information is collated:

- MMO
- Cefas
- EA
- IFCAs – Eastern, North-eastern and Northumberland
- National Federation of Fishermen's Organisations (NFFO)
- Fisheries Associations and Individual Fishers (as identified in Chapter 29)

25.4 Baseline Characterisation

25.4.1 The baseline characterisation sections include information on spawning and nursery grounds, protected species and designated sites specific to the Study Area.

25.4.2 Over 330 species of fish have been recorded in UK waters, with the North Sea supporting a wide variety of both pelagic (species that live within the water column) and demersal (species that live or feed on the seabed) species (DECC, 2022). The species most likely to be affected by the Projects are those with demersal life stages, and those sensitive to underwater noise changes e.g., hearing specialists such as clupeoids (e.g., Atlantic herring, shad, sprat).

25.4.3 The North Sea is home to important fishing grounds used not only by the local English and Scottish fleet but also by international vessels from Belgium, the Netherlands, Denmark, France, Ireland, Spain and Germany. To enable accurate monitoring the sea is divided into rectangles by ICES. Each ICES rectangle is approximately 30 NM squared and is 30 min latitude and 1^{o} longitude in size (ICES, 2022). Analysis of the fishing data from these ICES rectangles has been used as an indication of the commercial fish species present in the Study Area, but it is recognised that it does not provide a definitive list of species present.

Spawning and Nursery Grounds within the Study Area

25.4.4 Table 25-3 summarises the species which use the Study Area as spawning and nursery grounds and the months within which this occurs. Spawning grounds are described as the location where eggs are laid, and nursery grounds are the location where juveniles of a species are common. Information is taken from the Cefas fisheries sensitivities maps (Coull *et al.,* 1998; Ellis *et al.,* 2012). It also shows the intensity of 0 Group aggregations, which are fish within the first year of their lives (Aires *et al*., 2014).

25.4.5 Where information is available in the form of mapped data this has been presented in Figure 25-1 (Drawing C01494-EGL3&4-FISH-003) and Figure 25-2 (Drawing C01494-EGL3&4-FISH-004).

Table 25-3: Spawning and Nursery grounds that overlap with the Study Area

Species	Latin names	Spawning Zone	Intensity	Nursery Zone	Intensity	** Presence of Group 0 Aggregations	J	F	M	A	M	J	J	A	S	O	N	D
Anglerfish	*Lophius piscatorius*	n/a	n/a	Demersal	Low	Low												
Atlantic Cod	*Gadus morhua*	Pelagic	Low	Demersal	High	Low		*	*									
Atlantic Herring (Banks/Dogger Stock)	*Clupea harengus*	Demersal	High	Pelagic	High	Low/Medium												
Atlantic Mackerel	*Scomber scombrus*	Pelagic	Low	Pelagic	Low	Low					*	*	*					
Blue Whiting	*Micromesistius poutassou*	n/a	n/a	Pelagic	Low					*	*							
Common Sole	*Solea solea*	Pelagic/Demersal	Low	Demersal	Low	Low				*								
European Hake	*Merluccius merluccius*	n/a	n/a	Demersal	Low	Low		*	*									
European Plaice	*Pleuronectes platessa*	Pelagic/Demersal	High	Demersal	Low	Low	*	*										
European Sprat	*Sprattus sprattus*	Pelagic	Low	Pelagic	Low	Low/Medium					*	*						
Haddock	*Melanogrammus aeglefinus*	n/a	n/a	Demersal	Low	Medium/High		*	*	*								
Lemon Sole	*Microstomus kitt*	Demersal	Low	Demersal	Low													
Ling	*Molva molva*	n/a	n/a	Demersal	Low													
Nephrops	*Nephrops norvegicus*	Demersal	Low	Demersal	Low					*	*	*						
Norway Pout ***	*Trisopterus esmarkii*	Demersal	Low	n/a	n/a	Low		*	*									
Sandeels	*Ammodytidae spp.*	Demersal	Low	Demersal	Low													
Spurdog	*Squalus acanthias*	n/a	n/a	Viviparous	Low													

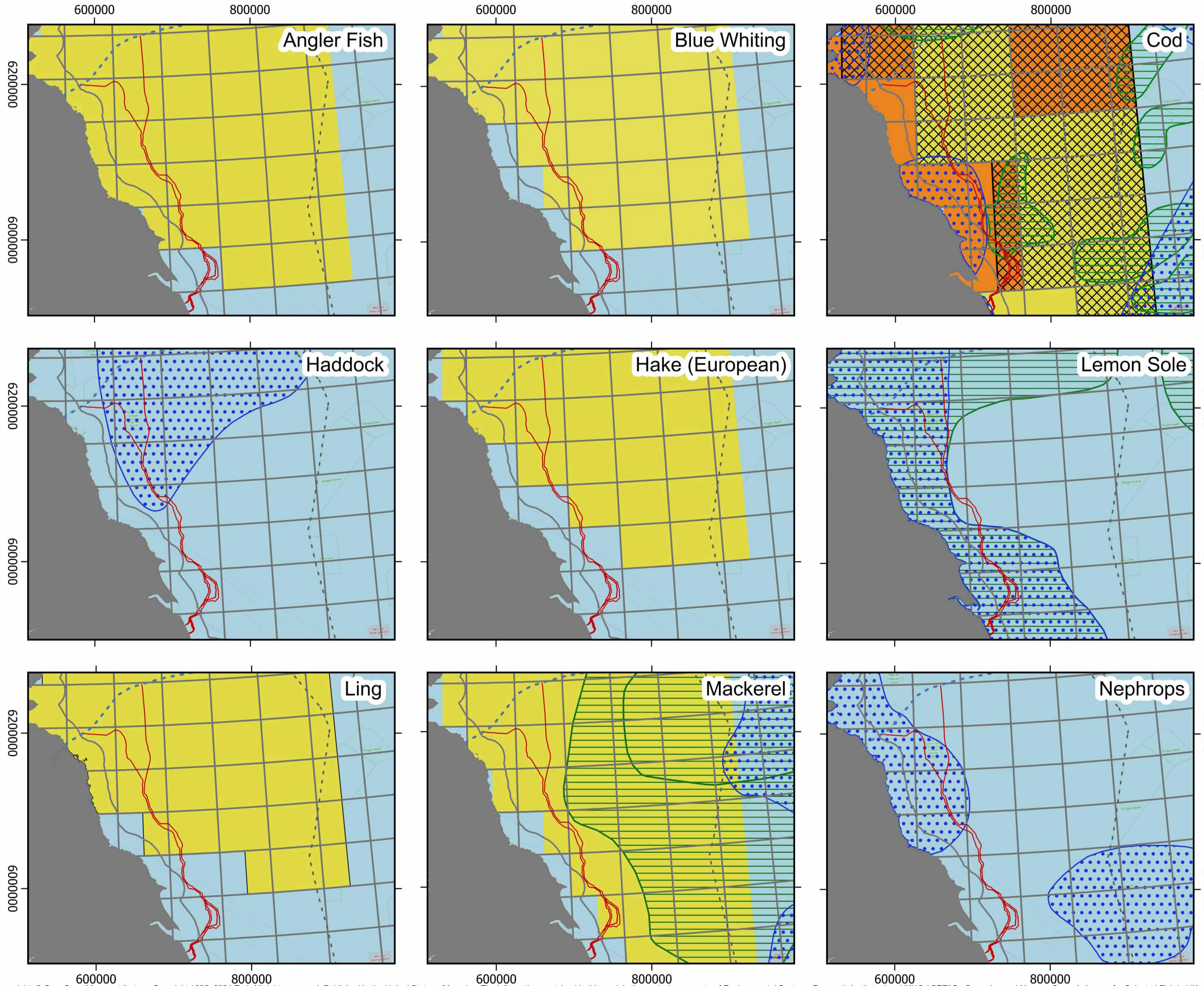
Species	Latin names	Spawning Zone	Intensity	Nursery Zone	Intensity	** Presence of Group 0 Aggregations	J	F	M	A	M	J	J	A	S	O	N	D
Thornback ray	*Raja clavata*	Demersal	Low	Demersal	Low					*	*	*	*	*				
Whiting	*Merlangius merlangus*	Pelagic	Low	Pelagic	High	Low												

Sources: Coull et al (1998), Ellis et al (2012), Aires (2014). * Peak Spawning. ** 0 Group fish defined as fish in the first year of their lives. *** Species only recorded as 0 Group fish within Study Area.

Spawning Only

Nursery Only

Both



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Fish Nursery and Spawning Grounds with Intensity of Activity within the Study Area - Map 1

C01494-EGL3&4-FISH-003-B

0 75 150 km

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- ICES Statistical Rectangles

Spawning and Nursery Grounds (Coull et al, 1998)
- Spawning
- Nursery

Spawning Grounds with Intensity (Ellis et al, 2012)
- High
- Low

Nursery Grounds with Intensity (Ellis et al, 2012)
- High
- Low

0 25 50 km

0 25 50 NM

Date	09/07/2024
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:4,500,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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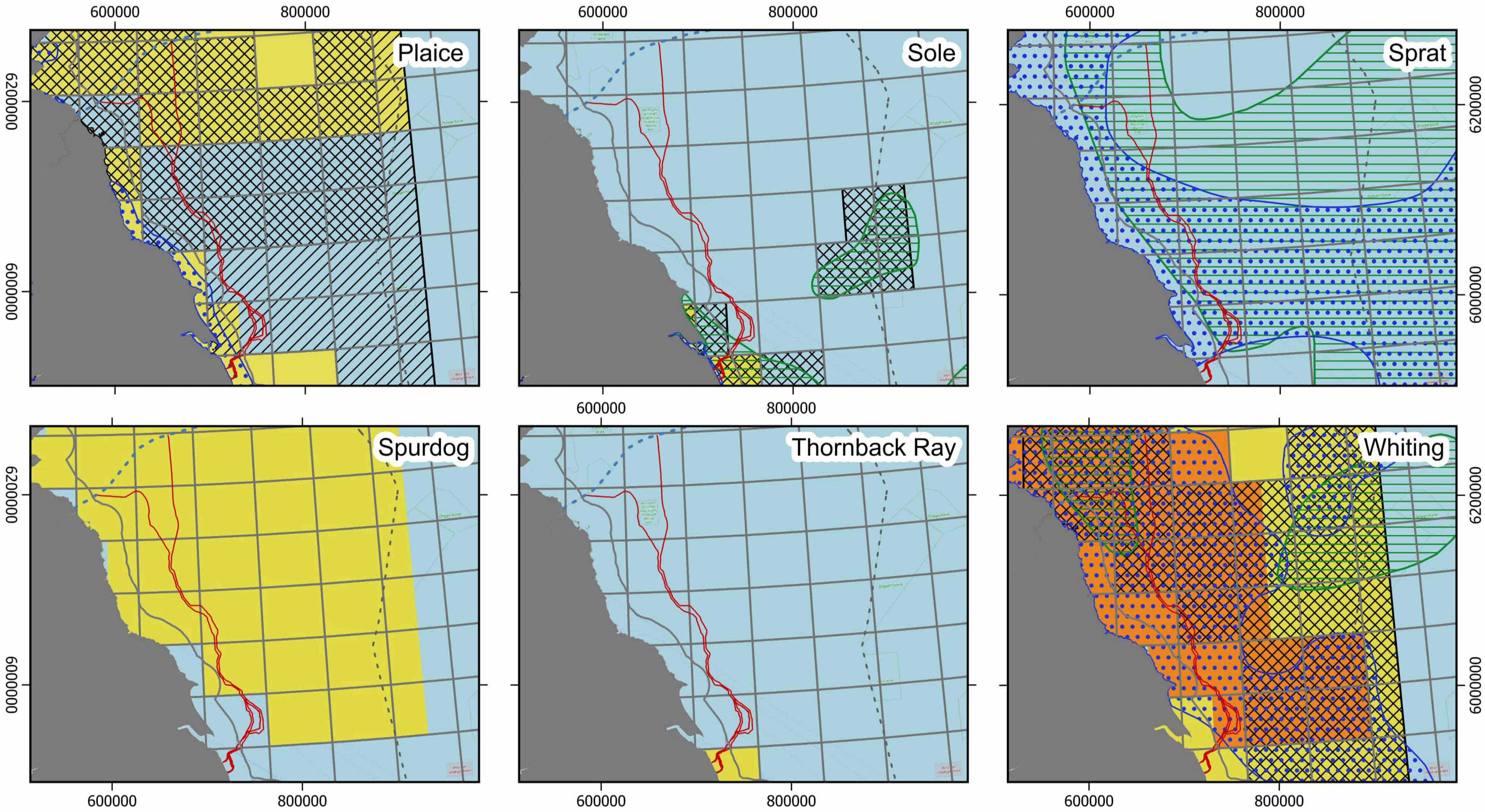

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Fish Nursery and Spawning Grounds with Intensity of Activity within the Study Area - Map 2

C01494-EGL3&4-FISH-004-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- ICES Statistical Rectangles

Spawning and Nursery Grounds (Coull et al, 1998)

- Spawning Grounds
- Nursery Grounds

Spawning Grounds with Intensity (Ellis et al, 2012)

- High
- Low

Nursery Grounds with Intensity (Ellis et al, 2012)

- High
- Low

0 25 50 km

0 25 50 NM

Date	09/07/2024
Coordinate System	ETRS89 / UTM zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:4,500,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 09/07/2024

Landing Information

25.4.6 The Scoping Boundary for the Projects crosses nine ICES rectangles, namely 35F0, 36F0, 37F0, 38E9, 38F0, 39E9, 40E9, 40E8 and 41E9. Analysis of the fishing data from the ICES rectangles has been used as an indication of the commercial fish species caught in these regions.

25.4.7 Table 25-4 shows the top four pelagic species caught in 2022 by catch weight and catch value within the Study Area, it should be noted that for pelagic species the order is the same for catch by weight and by value. Table 25-5 shows the top five species of shellfish species caught in 2022 by catch weight and catch value within the Study Area and Table 25-6 shows the same for demersal species.

Table 25-4: Top four pelagic species caught in 2022 within the Study Area by weight in tonnes and value (£s)

Most caught pelagic species by weight (t) and catch value (£s)
Herring
Mackerel
Horse mackerel
Shad

Source: MMO (2023)

Table 25-5: Top five shellfish species caught in 2022 within the Study Area by weight in tonnes and value (£s)

Most caught shellfish species by weight (t)	Most caught shellfish species by value (£s)
Crabs	Lobsters
Lobsters	Crabs
Scallops	Nephrops
Nephrops	Scallops
Whelks	Whelks

Source: MMO (2023)

Table 25-6: Top five demersal species caught in 2022 within the Study Area by weight in tonnes and value (£s)

Most caught demersal species by weight (t)	Most caught demersal species by value (£s)
Whiting	Whiting
Haddock	Monks & Anglers
Monks & Anglers	Halibut
Dab	Haddock

Most caught demersal species by weight (t)	Most caught demersal species by value (£s)
Cod	Cod

Source: MMO (2023)

General Species Information

Sensitive Demersal and Pelagic Species

Sandeel (Ammodytes spp.)

25.4.8 Sandeel have been recorded within the Study Area and are significant due to their importance as prey species for a number of bird, fish and marine mammal species. Sandeel hibernate in specific types of seabed during the autumn and winter, particularly coarse sand or fine gravel where they bury themselves in up to 50 cm of sediment (MarLIN, 2023). They briefly emerge from hibernation between December and January to spawn. During the spring and summer, they feed in the water column during the day and then bury themselves in the seabed at night. Their lifecycle makes them sensitive to seabed disturbance, especially during hibernation. Studies have found that sandeel are largely resident and do not disperse over distances greater than 30 km (RSPB, 2017), and that they do not migrate between grounds, suggesting that they are not successful re-colonisers (Jensen *et al.* 2011). Sandeel are not however considered to be sensitive to increased suspended sediment concentrations and deposition.

25.4.9 The sandeel's environment is under threat due to a variety of factors. Temperature variations can impact their metabolic rate and therefore affect reproduction and increase their mortality rate. Physical disturbances to their habitat or removal of sediment brought about by development on or nearby their habitat, and activities which can disrupt local water currents all can affect them and at the moment there is little data available on how sandeel recover from these threats.

25.4.10 The sandeel species Raitt's sandeel (*Ammodytes marinus*) are listed as a principal species of importance in England under Section 41 of the National Environment and Rural Communities Act (2006), meaning that they are of principal importance for the purpose of conserving or enhancing biodiversity (Defra, 2022). Sandeel are also noted in UK Biodiversity Action Plan (BAP) priority marine species of principal importance, requiring conservation due to their ecological importance as a prey species and their marked decline within the UK (a decline of 50% or more over the past 25 years or deterioration or loss of habitat) (BRIG, 2007).

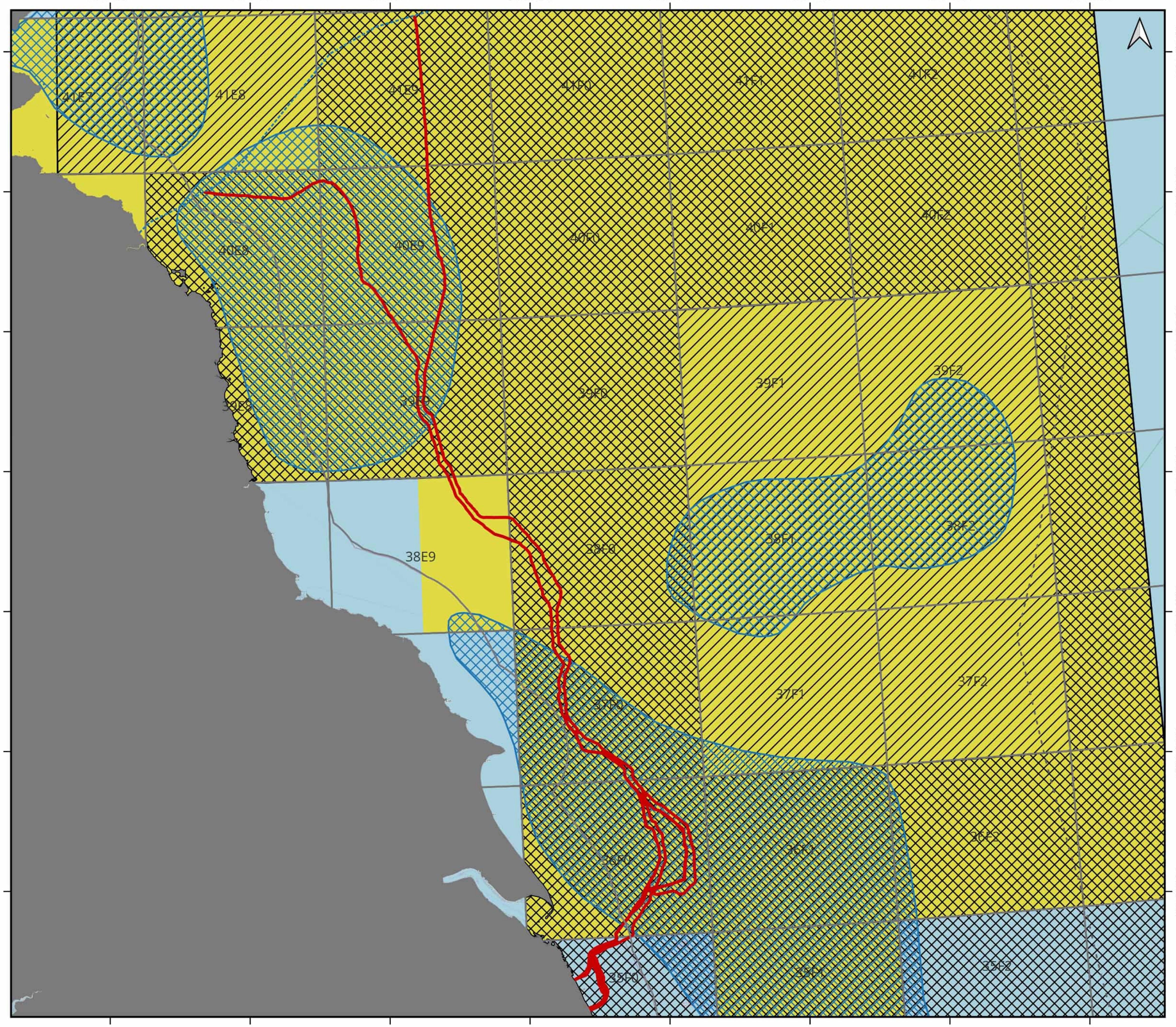
25.4.11 The Scoping Boundary crosses several known sandeel spawning grounds which are illustrated in Figure 25-3, Drawing C01494-EGL3&4-FISH-001.

Atlantic herring (Clupea harengus)

25.4.12 Atlantic herring is a pelagic species which spawns on the seabed. As benthic spawners, the species has a specific habitat preference of gravel and partly sandy gravel (Kyle-Henney *et al.,* 2024) which limits the spatial extent of their spawning grounds. As a result, they are particularly sensitive to any seabed disturbance. A programme of annual IHLS has taken place since 1967 to monitor the abundance of herring larvae (ICES, 2023). Atlantic herring numbers fluctuate annually, with Atlantic herring often abandoning and then returning to suitable areas. As a result, availability of all suitable areas of spawning habitat are necessary to maintain a resilient population.

25.4.13 There are four main autumn/winter-spawning populations of herring located across the North Sea alongside several discrete spring-spawning stocks. The autumn-spawning grounds include the Orkney-Shetland population, the Buchan population, the Banks (or Dogger) population and the Downs / Southern Bight population (Ellis *et al.,* 2012) and are characterised by different growth rates, recruitment patterns and migration routes. The Study Area crosses the Banks (off North-eastern England) Atlantic herring spawning grounds identified by Coull *et al.,* (1998). Typically, the Banks herring stocks spawn over summer and autumn, from August to October (Ellis *et al.,* 2012). This spawning ground is an important area for a large population of Atlantic herring stock in the North Sea.

25.4.14 Figures 25-4, Drawing: C01494-EGL3&4-FISH-002, illustrates the spawning and nursery grounds for Atlantic herring.



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Sandeel Spawning and Nursery Grounds

C01494-EGL3&4-FISH-001-B

- - - Exclusive Economic Zone Limit (EEZ)
12NM Limit
Scottish Adjacent Waters
Scoping Boundary
ICES Statistical Rectangles
Sandeel Spawning and Nursery Grounds (Coull et al., 1998)

Sandeel Spawning Grounds with Intensity (Ellis et al., 2012)
High
Low

Sandeel Nursery Grounds with Intensity (Ellis et al., 2012)
Low

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,350,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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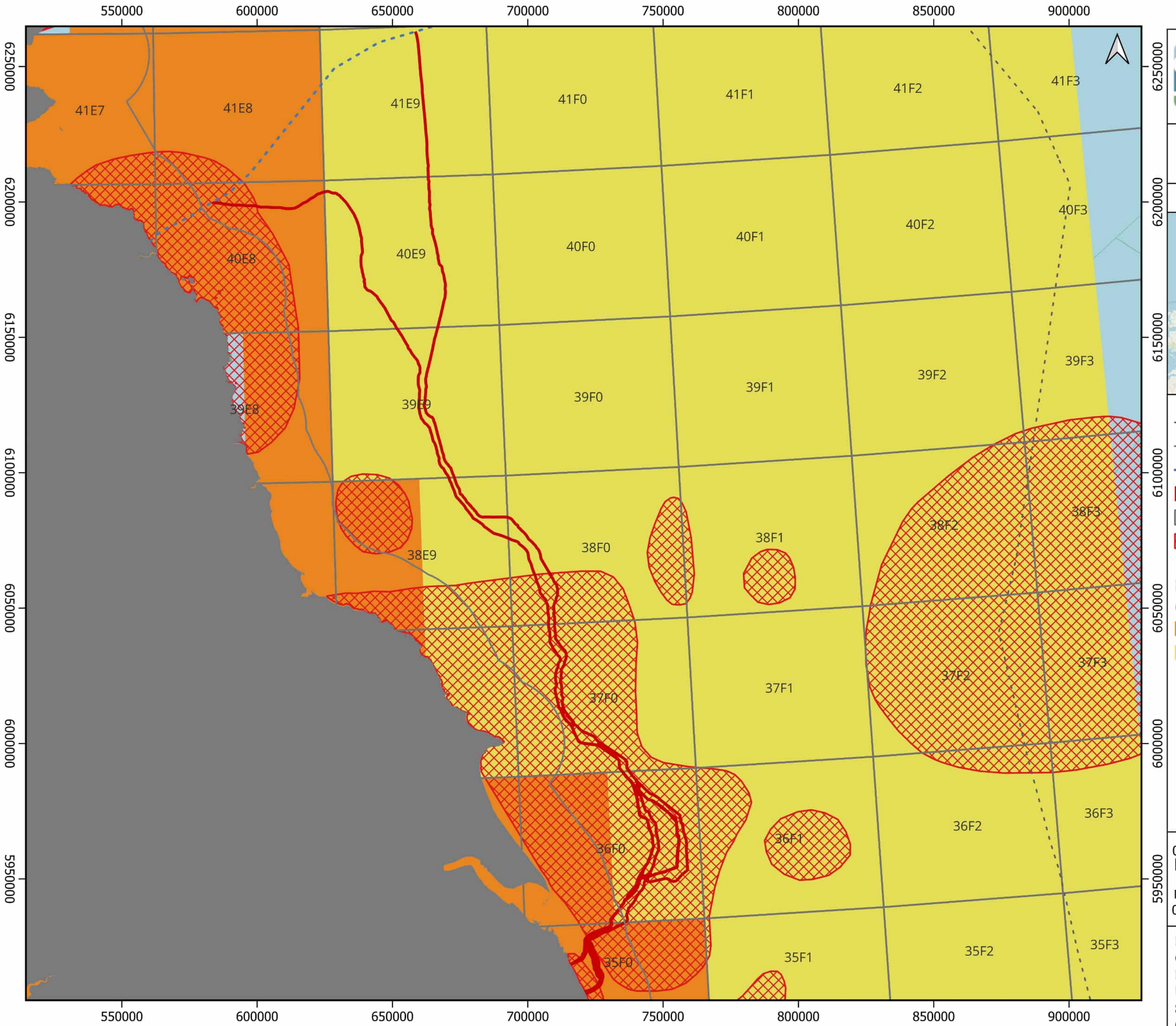

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Herring Spawning and Nursery Grounds

C01494-EGL3&4-FISH-002-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- ICES Statistical Rectangles
- Herring Spawning and Nursery Grounds (Coull et al., 1998)

Herring Nursery Grounds with Intensity (Ellis et al., 2012)

- High
- Low

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,350,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 09/07/2024

Diadromous and Catadromous Fish

25.4.16 Diadromous fish migrate between saltwater and freshwater, normally at the time of spawning. Catadromous fish spend most of their life cycle in fresh water and migrate to saltwater to spawn. The Humber Estuary SAC lies within the Study Area, close to the mouth of the Rivers Ouse, Hull and Trent and as such several species of diadromous and catadromous fish are found within the Study Area. Some of these fish are included on the protected species list presented in Table 25-7, including twaite and allis shad (*Alosa fallax, Alosa alosa),* sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilis*). The sea and river lamprey are both qualifying features of the Humber Estuary SAC which is located 4.1 km from the Scoping Boundary at its closest point and the Tweed Estuary SAC which is located 27.3 km from the Scoping Boundary relative to EGL 4 at its closest point. Allis and twaite shad are known to have spawning migrations between April and May and, although rare in the region, have been recorded in MMO annual catch statistics.

25.4.17 The Atlantic salmon (*Salmo salar*) is a diadromous species which is also found within the Study Area. Spawning takes place in shallow excavations called redds, found in shallow gravelly areas in clean rivers and streams where the water flows swiftly. The young that emerge spread out into other parts of the river. After a period of 1-6 years the young salmon migrate downstream to the sea as ‘smolts’. Salmon have a homing instinct that draws them back to spawn in the river of their birth after 1-3 years in the sea (JNCC, 2023). Salmon are an Annex II species and are noted as a qualifying feature of the River Tweed SAC which is located 30.5 km from the Scoping Boundary in relation to EGL 4 at its closest point.

25.4.18 Some fish species are more sensitive to disturbance or injuries caused by noise than others. Diadromous species including Atlantic salmon, sea lamprey and river lamprey are sensitive to noise and are electrosensitive. These species do not have specialised electroreceptors but are able to detect induced voltage gradients associated with water movement through the geomagnetic field (Viking Link, 2017). Rivers in England considered important for salmon, which are in proximity to the Scoping Boundary, include the River Tyne.

25.4.19 European eel are highly sensitive to noise and likely to be present within the Scoping Boundary. The River Tweed has an important population of European eel (Tweed Foundation, 2014) and it is possible that individuals will be present in the Scoping Boundary during their migration through the North Sea.

Smelt (Osmerus eperlanus)

25.4.20 Once widespread in the UK, the species is now in decline and subject to protection at certain key locations. The Northeast of Farnes Deep HPMA and MCZ provides a critical habitat for this species where it can complete some of its life cycle (gov.uk, 2023). The Scoping Boundary diverges around the HPMA and MCZ, with EGL 3 routeing to the east of the site and EGL 4 to the west. The HPMA and MCZ are both located 4.9 km from the Scoping Boundary relative to EGL 3 at its closest point, and 0.28 km from the Scoping Boundary in relation to EGL 4.

25.4.21 Smelt have been observed congregating in shoals in lower estuaries as they migrate into freshwater where they spawn in spring. The species lay their eggs onto the seabed where they adhere to coarse substrates and vegetation to prevent dispersal during incubation. Smelt are known to congregate near river mouths during winter and then ascend the river between February and April for spawning before returning to the sea (MarLIN, 2023a). The disturbance of seabed substrates or changes in siltation rates will directly impact smelt populations by causing physical damage and morality of embryos before hatching and reducing spawning habitat (Colclough & Coates 2013).

Elasmobranchs (Sharks, Rays and Skates)

25.4.22 Elasmobranchs are amongst the most vulnerable marine fish, due to their slow growth rates, late maturity, and low fecundity which limits their ability for population recovery should it decline. All sharks and rays are on the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) list of threated or declining species. There are a number of elasmobranchs which are regularly caught by commercial fisheries in the Study Area. These include thornback ray (*Raja clavata*), lesser spotted dogfish (*Scyliorhinus canicula*), spotted ray (*Raja montagui*), starry smooth-hound (*Mustelus asterias)*, blue skate (*Dipturus flossada*) and flapper skate (*Dipturus intermedia*), as well as white skate (*Rostroraja alba*) which are on the IUCN Red list.

25.4.23 Elasmobranchs are the predominant electroreceptive species present within the Study Area. The species have specialist electroreceptive organs (Tricas & Sisneros, 2004), which are sensitive to 5 to 20nV/m (Tricas & New, 1998), and are used to detect the bioelectric fields of prey and predators as well as being used for navigational purposes.

25.4.24 Skates and rays are amongst the most common bottom-dwelling fish. Thornback are known to use the Study Area as spawning and nursery grounds. The species peak spawning is between April and August (see Table 25-3).

25.4.25 The basking shark (*Cetorhinus maximus*) is the largest fish to visit UK waters measuring up to 12 m in length. Despite its size it feeds exclusively on plankton (MarLIN, 2023b). There are regular sightings in the summer months from southern Cornwall to the Scottish Isles, however sightings of basking shark within the Study Area are rare with only four sightings in the last 10 years.

Shellfish (Crustaceans and Molluscs)

25.4.26 Shellfish is a collective term for crustaceans (e.g., shrimp, lobsters, crabs) and molluscs (e.g., cockles, mussels, oysters, whelk) – animals which have a shell or shell-like exterior. They generally live in or on the seabed. Shellfish waters are protected areas under The Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations 2017 (as amended) (gov.uk, 2017). The Study Area does not intersect any protected shellfish areas.

25.4.27 A variety of shellfish species are targeted in the waters within the Study Area by commercial fisheries. The top five shellfish species by catch value in 2022 were common lobster (*Homarus gammarus*), edible crab (*Cancer pagurus*), Norway lobster (*Nephrops norvegicus*), scallop (*Pecten maximus*), and common whelk (*Buccinum undatum*) (MMO, 2023). Other species targeted include European common squid (*Alloteuthis subulata),* brown shrimp (*Crangon crangon*), and common cockle (*Cerastoderma edule*).

Ocean Quahog (Arctica islandica)

25.4.28 Ocean quahog are listed on the OSPAR list of threatened and/or declining species and habitats (OSPAR Commission, 2024). The species are found around all British and Irish coasts, as well as offshore. The growth rate of quahog is rapid in juveniles but very slow and indeterminate in adults. Individual growth rates are highly variable between different regions in the North Atlantic, within sites, between seasons and daily, depending on temperature, salinity, hydrography and food supply. They are the longest-unitary species with the oldest recorded specimen found being 507 years old (MarLIN, 2023c).

25.4.29 The ocean quahog is a burrowing species which has been found in a range of sediments, from coarse clean sand to muddy sand in a range of depths typically from 4 m to 482 m deep. Ocean quahog are thought to be highly sensitive to physical loss of habitat; it is therefore important to conserve the extent and distribution of supporting habitats to provide the best chance of any potential settlement for new recruits and to retain existing individuals (JNCC, 2018). As such, the ocean quahog is a protected species in several designated sites within the vicinity of or within the Study Area including the Holderness Offshore MCZ.

Edible crab (Cancer pagurus)

25.4.30 Edible crab fishing areas are distributed along the English and Scottish North Sea coast (Cefas, 2024). Previous tagging studies undertaken identified a northward migration of adult female crabs along the east coast of England and Scotland. Mating activity peaks in the summer once the females have moulted, with spawning occurring from July onwards (Eaton *et al.,* 2003; Tallack, 2007). According to Eaton *et al*. (2003), the Scoping Boundary crosses areas of high density of zoeae[3] (July 1999) noting that lower densities of zoeae were recorded in July 1993.

Norway Lobster (Nephrops norvegicus)

25.4.31 Norway Lobster are present in muddy habitats, with high concentrations of silt and clay. The species are known to occur in the Farn Deeps area, which is an essential winter fishery running from September to March (FishSource, 2023). The Scoping Boundary crosses this area.

Protected Species

25.4.32 Table 25-7 lists the protection afforded to species which have been identified within the Study Area. Some fish species are protected by several national and international conventions including:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES. The aim is to protect endangered plant and animal species from illegal trade and over-exploitation.
- Convention for the Protection of the Marine Environment of the North-East Atlantic – OSPAR Convention. The OSPAR Convention aims to protect the marine environment of the North-East 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 Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (COMHSR)

[3] Free swimming larvae of a crab

- Natural Environment and Rural Communities (NERC) Act.
- Wildlife and Countryside Act 1981 (as amended in 1985).

Table 25-7: Protected species observed within the Study Area

Species	International			UK			England
	OSPAR	CITES	IUCN	Wildlife and Countryside Act[1]	COMHSR	Features of Conservation Interest (FOCI)	Species of Principal Importance
Pelagic species							
Herring (*Clupea harengus*)			Least concern				Y
Horse mackerel (*Trachurus trachurus*)			Least concern				Y
Mackerel (*Scomber scombrus*)			Least Concern				Y
Demersal Species							
Atlantic cod (*Gadus morhua*)	Y		Vulnerable				Y
Atlantic halibut (*Hippoglossus hippoglossus*)			Endangered				Y
Bass (*Dicentrarchus labrax)*			Least concern				
Haddock (*Melanogrammus aeglefinus)*			Vulnerable				
Ling (*Molva molva*)			Least concern				Y
Plaice (*Pleuronectes platessa*)			Least concern				Y
Saithe (*Pollachius virens*)							
Sole (*Solea solea*)			Data deficient				Y
Whiting (*Merlangius merlangus*)			Least concern				Y
Elasmobranch species							
Basking shark (*Cetorhinus maximus*)	Y	Appendix II	Endangered	Schedule 5			Y
Blonde Ray (*Raja brachyura)*			Near Threatened				
Common Skate (*Raja batis*)	Y		Critically endangered				Y
Blue skate (*Dipturus flossada*)							

Species	International			UK			England
	OSPAR	CITES	IUCN	Wildlife and Countryside Act[1]	COMHSR	Features of Conservation Interest (FOCI)	Species of Principal Importance
Flapper Skate (Dipturus intermedius)	Y		Critically endangered				Y
Cuckoo Ray (*Leucoraja naevus*)			Least Concern				
Lesser spotted dogfish (*Scyliorhinus canicula)*			Least Concern				
Nurse hound (*Scyliorhinus stellaris*)			Near Threatened				
Starry smooth-hound (*Mustelus asterias*)			Near Threatened				
Spotted ray (*Raja montagui*)	Y		Least Concern				
Starry Ray (*Amblyraja radiata*)			Least Concern				
Thornback Ray (*Raja clavata*)	Y		Near Threatened				
White Skate (*Rostroraja alba)*	Y		Endangered				Y
Diadromous species							
Allis shad (*Alosa alosa*)	Y		Least Concern	Schedule 5	Annex II & V		Y
River Lamprey (*Lampetra fluviatilis*)			Least Concern		Y		Y
Sea Lamprey (*Petromyzon marinus*)	Y						Y
Smelt (*Osmerus eperlanus*)			Least Concern			Y	Y
Twaite shad (*Alosa fallax*)			Least Concern	Schedule 5	Annex II & V		Y
Anadromous species							
Atlantic Salmon *(Salmo salar)*	Y		Vulnerable		Annex II		Y
Shellfish Species							
Cuttlefish (*Sepia officinalis)*			Least Concern				
Ocean quahog (*Arctica islandica*)	Y					Y	

Sources JNCC (2007), OSPAR (2023) IUCN (2023)

Designated Sites

Holderness Offshore MCZ

25.4.33 Two routes are being investigated for the English Offshore Scheme; one that largely avoids the MCZ by routeing around the eastern boundary; and one that crosses directly through the site. The Scoping Boundary encompasses both options. For EGL 3 the eastern route option avoids the site (although the Scoping Boundary overlaps for 1.2 km), whilst the alternative route option crosses the site for 21.1 km. For EGL 4 the eastern route option crosses the site for 9.5 km whilst the alternative route crosses the site for 20.8 km.

25.4.34 The MCZ covers an area of 1,176 km^2 and is located approximately 11 km offshore from the Holderness coast in the Southern North Sea region. It crosses the 12 NM territorial seas limit and overlaps with the Southern North Sea SAC (JNCC, 2019). The seabed of the Holderness Offshore MCZ is predominantly composed of sediment habitats ranging from subtidal sand to subtidal coarse sediment and contains part of a glacial tunnel valley. The varied nature of the seabed means it supports a wide range of species, both on and in the sediment, including multiple species of worms, mussel beds, sponges, starfish and crustaceans (such as crabs and shrimp). The site is also a spawning and nursery ground for a number of fish species, including lemon sole, plaice and European sprat. Ocean quahog has also been recorded within the site. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

Humber Estuary SAC

25.4.35 The Scoping Boundary lies approximately 4.07 km from The Humber Estuary European Marine Site which is comprised of the Humber Estuary SAC, Humber Estuary SPA, Humber Estuary Ramsar Site and Humber Estuary SSSI. The site extends for 366.57 km^2 and includes the second largest coastal plain estuary in the UK (JNCC, 2023a). The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Significant Annex II migratory fish species are present and include river lamprey and sea lamprey, which breed in the River Derwent, a tributary of the River Ouse and are a protected species of the SAC. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

25.4.36 Table 25-8 summarises the seasonality of sea and river lamprey within the SAC.

Table 25-8: Seasonality of protected species in Humber Estuary SAC

Feature	Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
River Lamprey	Downstream Migration (Juveniles)	■	■	■	■	■	■	■	■				
River Lamprey	Spawning (Freshwater)			■	■								
River Lamprey	Upstream migration (Adults)	■	■	■				■	■	■	■	■	■
River Lamprey	Estuarine feeding	■	■	■	■	■	■	■	■	■	■	■	■

Feature	Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea Lamprey	Downstream Migration (Juveniles)	■	■	■	■						■	■	■
Sea Lamprey	Spawning (Freshwater)					■	■	■					
Sea Lamprey	Upstream migration (Adults)		■	■	■	■	■						

Source: Natural England (2018)

North East of Farnes Deep HPMA and MCZ

25.4.37 The Scoping Boundary diverges around the North East of Farnes Deep HPMA and MCZ with EGL 3 routeing to the east of the site and EGL 4 to the west. The HPMA and MCZ is located 4.9 km from the Scoping Boundary in relation to EGL 3 at its closest point, and 0.28 km from the Scoping Boundary in relation to EGL 4. The HPMA and MCZ are located approximately 55 km offshore from the north Northumberland coast, in the northern North Sea. The habitats within the sites are relatively stable and support a diverse range of marine flora and fauna such as anemones, worms, molluscs, echinoderms and fish species. Also found here is the ocean quahog which is a FOCI and smelt (JNCC, 2023b). The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

River Tweed SAC

25.4.38 The River Tweed SAC is located 30.5 km from the Scoping Boundary in relation to EGL 4 at its closest point. The SAC supports a very large, high-quality salmon population in a river which drains a large catchment on the east coast of the UK, with sub-catchments in both Scotland and England which enters the sea in Berwick. The site extends for 374.2 km^2. Considerable work has been undertaken by the Scottish Environment Protection Agency (SEPA) and the River Tweed Foundation in tackling pollution and easing the passage of salmon past artificial barriers in the river. This has reversed many of the river’s historical problems with water quality and access for salmon. The site not only supports a population of Atlantic salmon but other Annex II species including sea lamprey, brook lamprey and river lamprey (JNCC, 2023c). The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species (Natural England, 2018a).

Tweed Estuary SAC

25.4.39 The Tweed Estuary SAC is located 27.3 km from the Scoping Boundary in relation to EGL 4 at its closest point. The Tweed Estuary SAC is a complex estuary located on the north-east coast of England which discharges into the North Sea. The variety of intertidal sediment present within the estuary support a wide range of invertebrate communities including worms, molluscs and crustaceans. The diversity of species and habitats increases up the estuary with increasing shelter until the lower salinity estuarine conditions limit the diversity to species tolerant of brackish water only. Atlantic salmon and Allis shad are present within the estuary. River lamprey and sea lamprey can be found in spring when adult migrate pass the estuary to spawn in sand beds and silt in the upstream sections of the river. Both sea and river lamprey are protected as Annex II species and are a qualifying feature of the Tweed Estuary SAC. The conservation status for the site is to maintain and/or restore the favourable conservation status of the species (Natural England, 2018b).

25.5 Proposed Assessment Methodology

25.5.1 The fish and shellfish EIA will follow the assessment approach set out in Part 3, Chapter 21 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach.

25.5.2 Data derived from the site-specific survey will provide a more detailed site characterisation and fill key data gaps such as sediment particle size distributions (which informs the presence of species such as sandeel and herring), habitat biotopes and extent of shellfish beds (if present). A sandeel and Atlantic herring desk-based habitat assessment has been undertaken. This will be supplemented by the marine survey data to inform the assessment of effects. In addition, the results from any assessment undertaken to inform the marine physical processes chapter will be used to establish the potential impacts on fish and shellfish.

25.5.3 Where impacts are not predicted to be significant, simple assessments, using an evidence-based approach that is proportionate to the anticipated level of significance will be undertaken. The potential for mortality, permanent and temporary injury and behavioural disturbance of noise sensitive fish and shellfish receptors based on impact thresholds reported in Popper *et al*. (2014) will be assessed.

25.5.4 Where significant effects are identified, mitigation measures will be proposed, and residual effects presented.

25.6 Scope of Assessment

25.6.1 A range of potential impacts on fish and shellfish have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 25-9 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage, the impact has been scoped ‘in’ to the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped ‘out’ of the EIA.

Table 25-9: Scoping assessment of impacts on fish and shellfish

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	 Operation (including repair and maintenance)	 Decommissioning
Temporary habitat loss/seabed disturbance *(Abrasion/disturbance of the substrate on the surface of the seabed* *Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion)*	Boulder clearance, PLGR, pre-sweeping of sand waves. HDD duct excavation. Cable burial and trenching. Anchoring / jack-up foundations.	Shellfish and marine species with demersal life stage	**IN –** Any disturbance of the seabed has the potential to effect species which use the seabed for part/all of their lifecycle. Species most at risk are those that live in the upper layers of sediment (e.g., cockles), those that live on the seabed with limited mobility (e.g., ocean quahog, whelk, crab, lobster, hibernating sandeel) or those which lay their eggs on the seabed (demersal spawners) e.g., herring. The Projects cross many spawning and nursery grounds and whilst these cover large areas of the North Sea suitable habitats within these areas may be limited. Disturbance during the spawning season could have a direct impact on the spawning biomass for a specific year group. The assessment will focus on the effect on shellfish species due to their limited mobility and high commercial values and sandeel and herring as significant prey species.	**IN –** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during installation. However, if the activity takes place during key spawning periods, impacts could potentially be significant.	**IN –** The significance of the effect during decommissioning is similar or of lower magnitude than installation. However, effects could potentially be significant if within a sensitive spawning ground.
		Species with fully pelagic lifecycle	**OUT –** Species which have a fully pelagic lifecycle will not be significantly affected by disturbance of the seabed and will therefore be scoped out of the assessment.		
Permanent habitat loss	Deposit of external cable protection.	Shellfish and marine species with demersal life stage	IN – The presence of the deposit of external cable protection has the potential to change the seabed type, changing the habitat for shellfish and marine species with demersal life stages. They also have the potential to	IN – If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial	**IN –** The significance of the effect during decommissioning is similar or if lower magnitude than installation. However,

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	Operation (including repair and maintenance)	Decommissioning
(Physical change (to another seabed type or sediment type) *Water flow (tidal current) changes including sediment transport considerations)*			alter sediment transport at a local level, creating scour pits or causing accretion. If the deposits are close to sensitive shellfish beds or within demersal spawning grounds, there is the potential that changes to the habitat could have a significant effect on shellfish or species with demersal life stages. The significance of the effect will vary according to local factors such as the position of the external cable protection in relation to the prevailing current, the mobility of the seabed, and the sensitivity of the habitat. Information from ecological and marine surveys will be used to avoid areas of significant importance where possible. However, as the locations where external cable protection will be used has not currently been identified, the impact pathway cannot be scoped out of the assessment.	external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude that during installation. However, if the activity takes place during key spawning periods, impacts could potentially be significant.	effects could potentially be significant if within a sensitive spawning ground. Removal of cable protection during decommissioning may cause permanent habitat loss to any shellfish that have colonised the cable project over the Projects lifetime.
		Pelagic Species	**OUT –** Species which have a fully pelagic lifecycle will not be significantly affected by localised seabed deposits and will therefore be scoped out of the assessment		
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes*	Pre-sweeping	Shellfish and marine species with demersal life stage	**IN** - Pre-sweeping of sand waves involves the re-positioning of large quantities of sediment from the cable route to either immediate alongside the cable route, or to a separate disposal location. Depending on the technique used and the size of sand waves requiring pre-sweeping, the redeposition of sediment can cause smothering >10 cm deep over relatively wide areas of seabed (in the order of tens of thousands square metres). Effects	**OUT –** Pre-sweeping is used during construction to ensure that the cables are buried below the base of mobile sediments. Generally during operation, remedial works are focused on protecting sections of cable that have become exposed due to sediment mobility, or to repair cables that have been damaged by a third party (e.g.,	**IN –** Pre-sweeping or controlled flow excavation could be used during decommissioning to expose the buried cable. The significance of the effect during decommissioning is similar or of lower magnitude than

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	Operation (including repair and maintenance)	Decommissioning
Hydrocarbon & PAH contamination)			could potentially be significant if the disposal site contains sensitive spawning grounds, ocean quahog aggregations or shellfish beds. Therefore, the impact pathway cannot be scoped out for this specific activity until further information is available on the areas that will require pre-sweeping.	fishing damage). Pre-sweeping would not be required during a cable repair for third-party damage as the cable would already be exposed on the seabed. Therefore, the only scenario pre-sweeping might be required is where the cable has been damaged during construction and develops a fault in an area where pre-sweeping was used during construction. In this scenario the significance of the effect will be of lower magnitude than during construction and has been scoped out of the assessment.	construction. However, effects could potentially be significant if within a sensitive habitat.
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Seabed preparation (e.g., boulder clearance, PLGR). HDD duct excavation Cable burial and trenching. Anchoring / jack-up foundations. Deposit of external cable protection.	All species (except cockles)	OUT - The most significant contributor (relatively) will be from the sediment plume generated by cable trenching. During trenching the area affected depends on the trenching technique deployed e.g., ploughing will create a slightly larger footprint than jet trenching. However, in both cases the spatial extent of heavy smothering is extremely localised, restricted to less than a couple of metres either side of the trench (Gridlink, 2020, BERR, 2008) and significant effects are unlikely. Modelling undertaken for other cable projects (e.g., Viking Link reported in Intertek 2017, GridLink 2020, BERR 2008) indicates that approximately 90% of the suspended sediment is re-deposited within close proximity (<100m) and would be classed as heavy smothering. The remaining 10% is	OUT - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair work or remedial external cable protection may be required. In these circumstances the significance of the effect will be of lower magnitude than during construction and the impact has therefore been scoped out of the assessment for the same reasons.	OUT - The significance of the effect during decommissioning is similar or of lower magnitude than construction and has therefore been scoped out of the assessment for the same reasons.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	 Operation (including repair and maintenance)	 Decommissioning
			transported over a wide area, which depending on the strength of the prevailing currents could be as far as 10 – 15 km but will be deposited in thicknesses of less than 2 mm. With respect to changes in water clarity, the benchmark used by NE for the pressure is a change in one rank e.g., from clear to intermediate, on the Water Framework Directive scale for one year. While trenching is undertaken a sediment plume will be generated continuously, but it will move with the location of the cable spread. Sands and gravels do not form part of the sediment load and will settle out of suspension quickly. Modelling undertaken for other cable projects (e.g., Viking Link reported in Intertek 2017, GridLink 2020, BERR 2008), concludes that regardless of the position along a cable route, the sediment plume generated is aligned with the dominant tidal axis. Material is deposited primarily along the dominant tidal axis but with some lateral extension. Over most of the plume the increase in suspended sediment concentrations is generally lower than 30mg/l with natural conditions returning within a single tidal cycle following the cessation of activities, although if very fine chalk particles are present this could be extended to 4-5 days. Overall, the change in water clarity is not significant and generally in line with changes experienced during storm conditions		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	 Operation (including repair and maintenance)	 Decommissioning
			when background concentrations can reach 1000mg/l (Gridlink, 2020). Sediment contamination in the North Sea is focused on areas of high anthropogenic activity e.g., around disposal sites, estuaries and where drilling activity has taken place. Sediments in areas where pre-sweeping is proposed will be tested to ensure compliance with Cefas Action Levels for disposal.		
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Seabed preparation (e.g., boulder clearance, PLGR). HDD duct excavation. Cable burial and trenching. Anchoring / jack-up foundations. Deposit of external cable protection.	Cockles	IN – Cockles are susceptible to smothering and changes in water quality. There is a cockle area in ICES rectangle 35F0 within The Wash which is in the Study Area. There could be some concerns amongst fisheries stakeholders that if contaminated sediments are suspended by cable trenching this could have a significant impact on sensitive cockle beds. Other recent projects where reported sediments have been contaminated with heavy metals, PCBs and PAHs were analysed against Cefas Guidelines which concluded that there were considered to be of no concern (NeuConnect, 2019). Indirect effects from the mobilisation of contaminants entering the food chain are not predicted to be significant. However, the impact pathway will not be scoped out for this specific activity until further information is available on seabed contamination levels within the Projects.	OUT - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during installation and has therefore been scoped out of the assessment.	OUT - The significance of the effect during decommissioning is similar or of lower magnitude than installation and has therefore been scoped out of the assessment.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	Operation (including repair and maintenance)	Decommissioning
Accidental spills *(Hydrocarbon & PAH contamination)*	Presence of project vessels and equipment	All species	**OUT –** Projects' vessels and contractors will 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. Compliance with Regulations will be sufficient to minimise the risk to the environment.		
Introduction or spread of marine invasive non-native species (MINNS)	Presence of project vessels and equipment. Deposit of external cable protection.	Shellfish	**OUT –** Although the introduction of Projects' vessels, equipment, and external cable protection have the potential to introduce and spread MINNS, all relevant guidelines will be followed (GB Non-native Species Secretariat, 2015) including vessel cleaning facilities and the use of anti-fouling paint. Projects' vessels and contractors will comply with the International Convention for the Control and Management of Ships' Ballast water and Sediments. All seabed deposits will be inert with no biologically active material. Projects' vessels will complete a biosecurity risk assessment prior to arriving on site which will include factors such as origins of the vessels and ensuring that relevant equipment is cleaned before use. Compliance with Regulations will be sufficient to minimise the risk to the environment.		
Underwater noise changes	Presence of project vessels and equipment	All species	OUT – All of the operations involved in the preparation and construction of subsea cable generate underwater sound. The presence of vessels creates a continuous sound. The Projects will be a one-off event set against a background of existing shipping noise. Any effects will be localised and short-term and are not predicted to be significant.	OUT - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during construction and has therefore been scoped out of the assessment for the same reasons.	OUT - The significance of the effect during decommissioning is similar or of lower magnitude than construction and has therefore been scoped out of the assessment for the same reasons.
Collision risk	Presence of project vessels and equipment	Basking shark	**OUT –** There have only been a couple of sightings of basking shark within the waters of the Study Area during the last 20 years (NBN Atlas, 2023) This impact pathway has been scoped out due to the scarcity of the species within the Study Area.		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Electromagnetic changes / Barrier to species movement	Presence of cables	All species	N/A	IN – Some species of mollusc, crustacean, marine fish and elasmobranchs detect electric and magnetic fields. Bundling of the cables and cable burial reduces the EMF exposure. Given that calculations as to the field strength and burial depths have not been undertaken this impact pathway cannot be scoped out of the assessment at this stage.	N/A
Temperature increase	Presence of cables	Species with demersal life stage	N/A	IN – During the operation of an HVDC cable heat losses occur because of the resistance in the cable/conductor. This can cause localised heating of the surrounding environment (i.e., sediment for buried cables, or water in the interstitial spaces of external cable protection). There are no specific regulatory limits applied to temperature changes in the seabed, although a 2°C changed between seabed surface and 0.2 m depth is used as a guideline in Germany. Evidence from other projects (Viking Link - National Grid and Energinet, 2017; NeuConnect - NeuConnect, 2019; EGL1) suggests that any temperature changes will be localised to the immediate environment surrounding the cable	N/A

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	 Operation (including repair and maintenance)	 Decommissioning
				and undetectable against natural temperature fluctuations in the surrounding sediments and water column. Although no significant effects are predicted, the CBRA has not yet been completed so burial depth is not known. As a precaution this impact will be scoped into the assessment.	

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26. Intertidal and Offshore Ornithology

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26. Intertidal and Offshore Ornithology

26.1 Study Area Definition

26.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Projects on Intertidal and Offshore Ornithology. Intertidal and Offshore Ornithology receptors include species of bird that use the intertidal and offshore area for breeding, foraging and loafing.

26.1.2 The Study Area for the intertidal and offshore ornithology assessment has been defined recognising the highly mobile nature of birds and the distance over which they can range. The extent of the Study Area incorporates the Scoping Boundary plus an additional 15 km either side of the English Offshore Scheme. This is a precautionary maximum zone of influence (based on the maximum tidal excursion) that encompasses the potential impact pathway from increased sediment concentrations, which could affect diving birds' ability to seek prey. The Study Area will be reviewed and refined for the EIA based on maximum tidal excursions and, if appropriate, sediment dispersion modelling. The zone of influence will be affected by the findings of Part 3, Chapter 23 – Marine Physical Processes, which should be read in conjunction with this chapter. The Study Area has considered:

- Seabird foraging ranges (Thaxter *et al*., 2012; Woodward *et al.,* 2019)
- Recent recommendations from statutory nature conservation bodies regarding maximum disturbance/displacement ranges for sensitive bird species (MIG-Birds, 2022).

26.1.3 According to advice from SNCBs, a maximum buffer of 10 km should be applied to consider red-throated diver (*Gavia stellata*), which are considered to be particularly vulnerable to disturbance (MIG-Birds, 2022), and a buffer of at least 4 km should be applied for other diving birds. The 15 km buffer used to define the Study Area is therefore sufficiently precautionary to cover the potential effects of displacement as well as potential effects resulting from increases in turbidity.

26.1.4 The Study Area for intertidal and offshore ornithology and its relation to the English Offshore Scheme is presented in Figure 26-1 (Drawing: C01494-EGL3&4-BIRD-001).

26.2 Data Sources

26.2.1 Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

26.2.2 Due to the temporary and transient nature of construction, offshore site-specific bird surveys are not considered necessary for the Projects. Wintering, breeding, passage and intertidal bird surveys (single year of data collection) will be undertaken for the English Onshore Scheme, which will be referred to as appropriate for the English Offshore Scheme. This would include walked transect surveys and may need to be timed to cover high and low tide survey periods, for the intertidal areas.

Publicly Available Data

26.2.3 A desk-based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Extensive contemporary and historic information are available regarding the ornithological characteristics of the North Sea and will be used in the EIA. Table 26-1 lists the key data sources which will be used in the assessment.

Table 26-1: Key publicly available data sources for intertidal and offshore ornithology

Data Source	Description
NE	Natural England Conservation Advice for Marine Protected Areas
JNCC	JNCC Conservation Advice for Marine Protected Areas
British Trust for Ornithology (BTO) Non-Estuarine Waterbird Surveys (NEWS)	Waterbird Populations: Numbers and Trends by Count Sector.
IUCN	The International Convention for the Conservation of Nature (IUCN) Red List of Threatened Species (https://www.iucnredlist.org/)
Offshore Energy Strategic Environmental Assessment 4 (DECC, 2022)	Appendix 1 Environmental Baseline, A1a.5 Birds https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1061529/Appendix_1a_5_-_Birds.pdf
BTO Wetland Bird Survey (WebS)	Annual survey reports of wetland waterbirds.
National Bird Atlas (Balmer et al., 2013)	Results of the five years of breeding season and wintering surveys across the UK at a 10 km resolution.
Environmental Statements and Scoping reports from OWF Developments.	Outer Dowsing Offshore Wind Preliminary Environmental Information Report Volume 1, Chapter 12: Intertidal and Offshore Ornithology (2023) Hornsea 4 Offshore Wind Farm Environmental Statement, Volume A2, Chapter 5: Offshore and Intertidal Ornithology (2021)

	Hornsea Offshore Wind Farm Project One Environmental Statement, Volume 5, Chapter 5.5.1 Ornithology Technical Report (2013) Hornsea 3 Offshore Wind Farm Environmental Statement, Volume 2, Chapter 5, Offshore Ornithology (2018) Triton Knoll Offshore Wind Farm Final Environmental Assessment Scoping Report (2009)
Environmental Appraisal Report for HVDC link projects. National Grid Electricity Transmission and Scottish Hydro Electric Transmission plc.	Eastern Green Link 2 Environmental Appraisal Report (2022)

Additional Studies

26.2.4 No specific additional studies will be undertaken to inform the baseline characterisation for this receptor. However, the EIA will draw upon the findings of studies undertaken for other topics such as sediment dispersion modelling (see Part 3, Chapter 23) and sandeel and Atlantic herring habitat assessment (see Part 3, Chapter 25).

26.3 Consultation

26.3.1 The scope of the intertidal and offshore ornithology chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consents strategy. Table 26-2 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 26-2: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
NE	Recommended that impacts of temporary increases and deposition of suspended sediments is scoped in for bird species which dive for prey. There is a risk that changes in water clarity could cause localised displacement from preferred feeding grounds due to changes in prey availability. It is especially pertinent for red-throated diver.	Table 26-9 has been updated.
NE	Several mitigation measures should be considered to reduce disturbance/displacement of Red throated Diver in the Greater Wash SPA, including seasonal restrictions during construction and O&M and adopting best practice, particularly when considered in-combination with other plans or projects.	Mitigation measures will be considered in the EIA process.

26.3.2 Further consultation to inform the PEIR will be undertaken with ornithology stakeholders to supplement the desk-top review and studies. The following bodies will be consulted, as a minimum, to ensure that the most up-to-date information is collated:

- NE
- JNCC
- MMO

26.4 Baseline Characterisation

Introduction

26.4.1 Intertidal and offshore ornithology refers to the diversity, abundance and function of marine bird species present in the Study Area up to MHWS, at all life stages including feeding, breeding, overwintering and migrating. Marine birds are highly mobile but can be constrained during certain times of the year by factors such as their need to return to a colony to feed and care for chicks, or when they are flightless during a post-breeding moult. Species can also be restricted by their foraging strategy, the availability of prey species and their sensitivity to human activities such as vessel traffic (Atterbury *et al.,* 2021).

26.4.2 For the purposes of this Scoping Report, marine birds have been grouped according to Atterbury *et al.* (2021) based on their sensitivity and exposure to impacts. Table 26-3 (extracted and adapted from Atterbury *et al.* 2021) describes the various functional groups.

Table 26-3: Marine bird groups (adapted from Table 3: Marine Bird in Atterbury et al., 2021 pg.4)

Function group	Information
Divers, grebes and mergansers	"*This group includes great northern diver, black-throated diver, red-throated diver, Slavonian grebe, and red-breasted merganser. These species tend to aggregate in coastal waters, and in bays, estuaries and firths. They can aggregate in large numbers in specific areas over the winter, whilst during the breeding season they tend to forage within restricted ranges from their breeding areas. Some of these species have a flightless period following breeding (moulting), during which they may be particularly sensitive to some impacts. They are largely thought to be water column feeders, although there is some evidence that some species may also be benthic feeders (Duckworth et al. 2020 in Atterbury et al. 2021).*" *"This group is highly sensitive to noise and visual disturbance, such as from vessel traffic (Fliessbach et al. 2019 in Atterbury et al. 2021). Since some of these species may not resettle quickly after being flushed, the vessel transit route plus a buffer of several kilometres may be effectively lost as habitat to some diver and grebe species, with evidence for this being particularly strong for red-throated diver (Mendel et al. 2019 in Atterbury et al. 2021)."* *"These species are thought to have some sensitivity to underwater noise and may be impacted by changes in suspended solids when foraging in the water column."*

Function group	Information
Seaducks, geese and swans	*"This group includes common eider, goldeneye, scaup, long-tailed duck, common scoter, velvet scoter, whooper swan, Bewick's swan, greylag goose, barnacle goose, pink-footed goose, dark-bellied brent goose, light-bellied brent goose, shelduck, pintail, pochard, shoveler, wigeon, teal, mallard and gadwall. This category includes species which breed in the UK, migrate through UK waters, and/or winter in the UK. They can use a variety of waters both inshore and offshore. They are benthic, surface or grazing feeders. While some diving sea duck species like eiders and scoters specialise in foraging on shellfish and crustaceans, others such as long-tailed duck, goldeneye and scaup are generalist feeders and their diet can include aquatic plants, polychaetes, amphipods, aquatic insects and some small fish. Other duck, swan and goose species within this group are surface feeders, utilising prey on the surface of intertidal habitats such as the small gastropod mollusc Hydrobia, as well as grazing on saltmarsh and coastal grazing marsh.* *Most species within this group are sensitive to visual and noise disturbance from vessel traffic (Fliessbach et al. 2019 in Atterbury et al. 2021). In two studies looking at the disturbance effects caused by vessels, common scoters were not observed resettling after being flushed (Schwemmer et al. 2011; Fliessbach et al. 2019 both cited in in Atterbury et al. 2021). However, most species in this group, it is not known if or how quickly they recover and move back to areas once a vessel has passed through. It is unknown whether species within this group are sensitive to underwater noise. For species which are benthic feeders, activities that are likely to disturb seabed habitats and species may affect the availability of suitable prey."*
Auks	*"There are four auk species commonly found in waters around the UK: Atlantic puffin, black guillemot, common guillemot and razorbill. They aggregate around the UK in inshore and offshore waters throughout the year. During the breeding season, they tend to form large colonies, and impacts occurring in favoured foraging areas within range of these colonies can have implications for their ability to successfully raise chicks. Adults have a flightless moult period immediately after chicks fledge, which can last several months. When chicks fledge, they too are flightless for several weeks. During these periods adults and chicks may be particularly sensitive to some pressures, including noise and visual disturbance. Auks are water-column feeders, feeding largely on pelagic and demersal fish.* *Auks are sensitive to noise and visual disturbance. Vessel transits through important foraging areas or aggregations of these species should be avoided. While there is evidence for underwater anthropogenic noise affecting the foraging behaviour of related species (African penguins; Pichegru et al. 2017 in Atterbury et al. 2021), it remains unclear how sensitive auks are to this impact. As these are species that feed in the water column, they may be affected by changes in water turbidity due to increases in suspended sediments…, which would affect their ability to successfully forage for their prey. In addition, disturbance and loss of seabed habitats can affect availability of suitable prey (e.g., sandeel)."*
Terns, gulls, kittiwakes and gannets	*"This group includes common tern, Sandwich tern, Arctic tern, little tern, roseate tern, great black-backed gull, lesser black-backed gull, herring gull, common gull, black-headed gull, Mediterranean gull, little gull, black-legged kittiwakes, petrel species and northern gannet. These species aggregate around the UK in inshore and offshore waters, with terns being present during the spring and autumn migrations and the breeding season, while others can be present in UK waters throughout the year. During the breeding season, they tend to breed in colonies, and impacts occurring in favoured foraging areas within range of these colonies can have implications for their ability to successfully raise chicks. Except for gannets, all species in this group are surface feeders, with some species also feeding in exposed tidal areas. They feed on a wide variety of marine prey including fish, squid, crustaceans, jellyfish and offal.* *These species are low to moderately sensitive to noise and visual disturbance, and some species within this group may be attracted to some vessels, potentially in hope of fishery*

Function group	Information
	discards/offal. It is unknown whether species within this group are sensitive to underwater noise. As most species in this group are surface feeders, they may be affected by changes in suspended solids that would affect their ability to successfully forage for their prey (van Kruchten & van der Hammen 2011; Cook & Burton 2010, both cited in Atterbury et al. 2021).”
Waders and harriers	*“This group includes wader species which breed, migrate and winter along the UK coast. Wader species have various foraging strategies, but all are surface or near-surface feeders, making use of open coast, mud and sandflats, saltmarshes, saline lagoons, rocky coasts (e.g., purple sandpiper, oystercatcher) and nearby grazing marsh and arable land to both feed and roost. Some, such as oystercatcher, are more (but not exclusively) reliant on localised food resources such as cockle and mussel beds whilst others are more generalist. Some species are largely restricted to certain breeding habitats (e.g., avocet: saline lagoons, saltpans and scrapes; ringed plover: sand and shingle, saltmarsh edges) whilst other species utilise a broader range of coastal and adjacent habitats.* *This group also includes marsh and hen harrier. Both species can use intertidal habitats extensively in winter for foraging and roosting. Marsh harrier will also utilise coastal habitats in the breeding season and may also breed in saline reedbeds.* *This group is sensitive to visual and noise disturbance from vessel traffic. Waders and other species using intertidal habitats are at risk from disturbance caused by people and machinery…across and adjacent to those habitats. In general, there is less risk of disturbance of those habitats from shipping…except where vessels capable of navigating shallow waters are employed. Activities that are likely to disturb their intertidal habitats and prey species may affect the availability of suitable prey for these species.”*

26.4.3 The southern North Sea and the adjacent coastline provide habitats (both breeding and foraging areas) for a wide range of both nationally and internationally recognised marine bird populations. The distribution and abundance of these bird populations fluctuates throughout the year depending on factors such as food availability and seasonality for periods such as breeding.

Species Overview

26.4.4 The proposed Landfalls are within the Greater Wash SPA, and the Scoping Boundary crosses a number of other neighbouring designated sites as it approaches the proposed Landfalls. The designated sites include a variety of marine habitats of importance for breeding and non-breeding birds, including extensive intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef. Offshore, the Scoping Boundary lies within a shallow area of low salinity which is important for a number of bird species, in particular divers, gulls, seaduck and terns (BEIS, 2022; JNCC, 1995). The area is characterised by extensive sandbank features present at depths of less than 25 m, many of which are protected for their importance in providing habitat and affecting water and sediment dynamics (BEIS, 2022). As discussed above and in Chapter 26 of this Scoping Report, a large proportion of the offshore area in this location is covered by other habitats and species listed under the relevant legislation (SACs).

26.4.5 The recent OESEA4 discusses aspects of the UK baseline environment to facilitate discussion around the potential for future development of renewable energy and oil & gas abstraction. It characterises the UK bird fauna as ‘western

Palaearctic', meaning that the majority of species are found across western Europe and extend into western Asia and northern Africa.

26.4.6 Digital aerial bird surveys from offshore wind farms in the Study Area (Outer Dowsing, Hornsea 3 and 4, Triton Knoll) consistently identified the marine birds listed in Table 26-4 as being present in the Study Area.

Table 26-4: Marine birds present in the Study Area

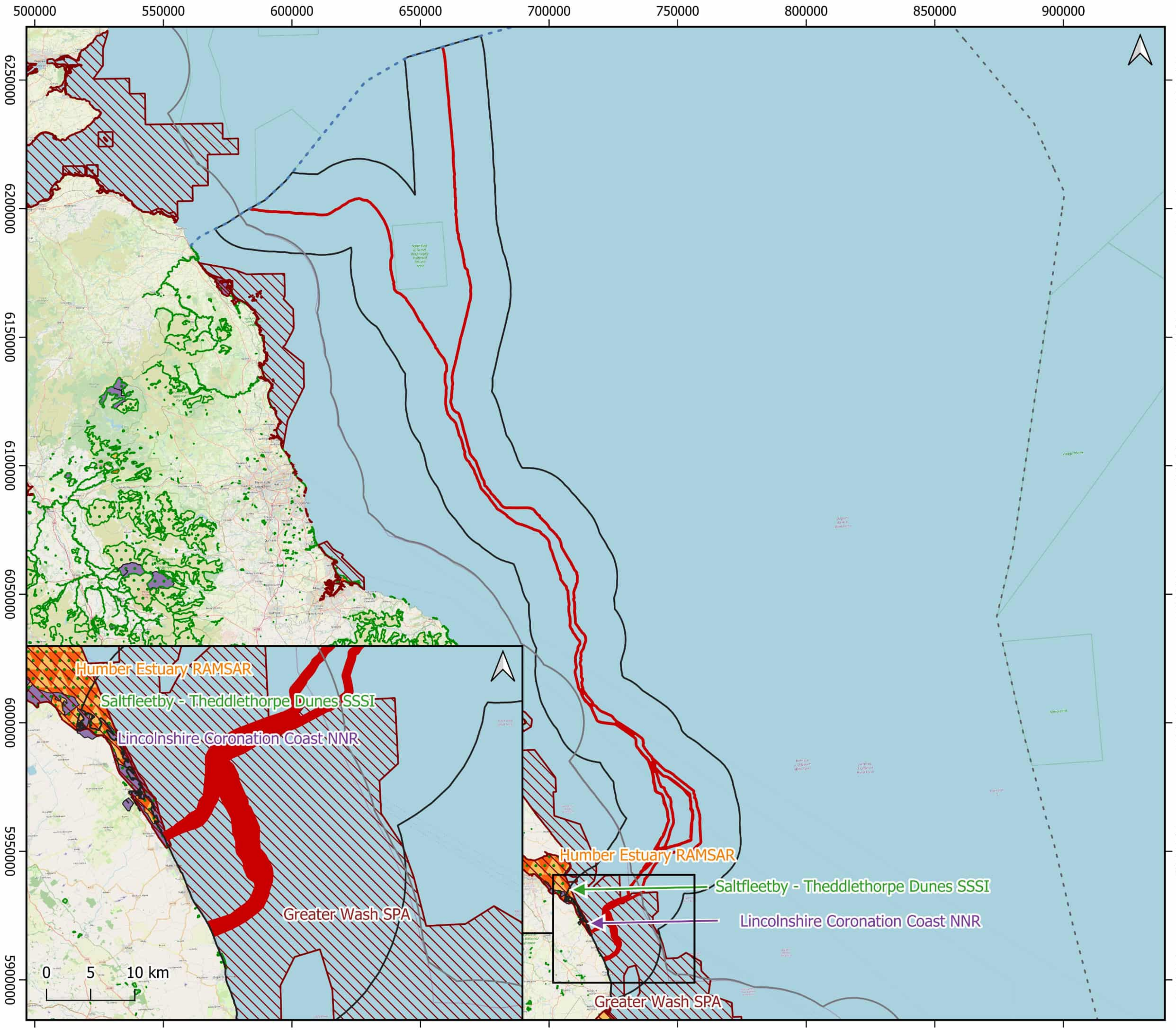
Functional Group	Species
Divers, grebes and mergansers	Red-throated diver, Gannet, Fulmar, Manx Shearwater, Shag
Auks	Puffin, Guillemot, Razorbill, Little auk
Terns, gulls, kittiwakes and gannets	Herring gull, Great black-backed gull, Lesser black-backed gull, Kittiwake, Black-headed gull, Little gull, Common gull, Sandwich tern, Common tern, Artic tern, Artic skua, Great skua
Seaducks, geese and swans	Common scooter
Waders and harriers	Curlew, Lapwing, Oystercatcher

Designated Sites

26.4.7 The intertidal and offshore areas along the Scoping Boundary are extensively covered by designated sites for the protection of bird species and their habitats, including SPAs, proposed SPAs (pSPAs), Ramsar sites, SSSIs and NNRs. These sites are illustrated in Figure 26-1 (Drawing: C01494-EGL3&4-BIRD-001). The following section identifies the designated features for these sites, as these are the species which are most likely to be seen within the Study Area and are considered the most relevant sensitive receptors for the purposes of characterising the environment. However, it should be noted that other bird species may be encountered within the Study Area.

26.4.8 There are several bird species known to be reliant on the intertidal habitats of the east coast that lie in the vicinity of the proposed Landfalls and the nearshore parts of the Projects. The intertidal environment of the Lincolnshire coast is characterised by shifting, sandy beaches, sand dunes and soft cliffs, and it is actively eroding. The Humber Estuary and The Wash are the northern and southern boundaries of the Lincolnshire coast, respectively. Intertidal areas of both the Wash and Humber are important habitat for wading birds. However, the distribution and abundance of seabirds in the area varies throughout the year depending on factors such as food availability and seasonality for periods such as breeding. These are summarised in Table 26-4 below, along with the bird species which have been identified as protected features. The proposed Landfalls (at Theddlethorpe and Anderby Creek) overlap the Greater Wash SPA which has offshore ornithological designations for breeding terns and overwintering red-throated diver and common scoter.

26.4.9 Table 26-5 presents the designated sites that are designated for ornithology identified using publicly available GIS data (JNCC, 2022). The Scoping Boundary to the Anderby Creek Landfall passes through the Greater Wash SPA for approximately 40 km, and to Theddlethorpe for approximately 18 km. It also passes through the Holderness Offshore MCZ, which is designated for subtidal habitats and species that support bird populations within the Study Area.



collaborative environmental advisers

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Intertidal and Offshore Ornithology Including Designated Sites

C01494-EGL3&4-BIRD-001-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- 15 km Study Area

Designated Sites

- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- RAMSAR Site

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

Document Path: X:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3&4\09_BIRD\C01494_EGL3&4_BIRD_001.qgz

Export Date: 09/07/2024

Table 26-5: Designated sites within proximity of the Study Area

Note: non marine birds are in light grey.

Designated site	Distance from Scoping Boundary * (km)	Site description	Protected feature
Humber Estuary SPA	Overlaps for 0.34 km	The Humber Estuary SPA is located on the east coast of England and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are owned and managed by conservation organisations. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern *Botaurus stellaris*, marsh harrier (*Circus aeruginosus),* avocet (*Recurvirostra avosetta)* and little tern (*Sterna albifrons)* (Natural England, 2014). The SPA covers an area of 37,630.24 ha and qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by over 20,000 waterbirds (waterbirds as defined by the Ramsar Convention) in any season.	**Breeding** Avocet (*Recurvirostra avosetta*) Bittern (*Botaurus stellaris*) Little tern (*Sterna albifrons*) Marsh Harrier (*Circus aeruginosus*) **Non-breeding** Avocet (*Recurvirostra avosetta*) Bar-tailed godwit (*Limosa lapponica*) Bittern (*Botaurus stellaris*) Black-tailed godwit (*Limosa limosa islandica*) Dunlin, Calidris (*alpina alpina*) Golden plover (*Pluvialis apricaria*) Hen harrier (*Circus cyaneus*) Knot, Calidris (*canutus*) Redshank (*Tringa tetanus*) Ruff (*Calidris pugnax*) Shelduck (*Tadorna tadorna*) Waterbird assemblage
Greater Wash SPA	Overlaps for 40.1 km	The Greater Wash SPA lies along the east coast of England, predominantly in the coastal waters of the mid–southern North Sea between the counties of Yorkshire to the north and Suffolk to the south. It covers an area of c. 3,536 km^2 and supports the largest breeding populations of little terns within the UK SPA network by protecting important foraging areas. It also supports the second largest aggregation of non-breeding red-throated diver and little gull (JNCC, 2018). The area of the SPA includes a range of marine habitats, including intertidal mudflats and sandflats, subtidal sandbanks and biogenic reef, including *Sabellaria* reefs and mussel beds. Much of the area is less than 30 m water depth, with a deep channel of 90 m depth at the Wash approaches.	**Breeding** Little tern (*Sterna albifrons*) Sandwich tern (*Thalasseus sandvicensis*) **Non-breeding** Common scoter (*Melanitta nigra*) Common tern (*Sterna hirundo*) Little gull (*Hydrocoloeus (Larus) minutus*) Red-throated diver (*Gavia stellata*)
Humber Estuary Ramsar	Overlaps for 0.34 km	The Humber Estuary Ramsar site is 379.88 km^2. It drains a catchment of some 24,240 km^2 and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4 m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. Vegetation includes extensive reedbeds, areas of mature and developing saltmarsh, backed by grazing marsh or low sand dunes with marshy slacks and brackish pools. The area regularly supports internationally important numbers of various species of breeding and wintering waterbirds. Many passage birds, notably internationally important populations of ringed plover (*Charadriu hiaticula),* and sanderling (*Caldris alba)* stage in the area. The site supports Britain's most southeasterly breeding colony of grey seal (*Halichoerus grypus)*. Human	**Wintering and Passage** Bar-tailed godwit (*Limosa lapponica*) Black-tailed godwit (*Limosa limosa*) Dunlin (*Calidris alpina*) Golden plover (*Pluvialis apricaria*) Knot (*Calidris canutus*) Redshank (*Tringa tetanus*) **Wintering** Shelduck (*Tadorna tadorna*) Waterbird assemblage

Designated site	Distance from Scoping Boundary * (km)	Site description	Protected feature
		activities include tourism, recreation, commercial and recreational fishing, livestock grazing, and hunting (Ramsar, 2023).	
Humber Estuary SSSI	4.6 km	The Humber Estuary SSSI is 108.66 km^2 and goes from Grimsby Dock to Humber Mouth Subtidal. The current condition of the site has been classed as unfavourable – recovering condition, with a section between Humberston and Louth Canal of favourable condition along the coast. Another favourable section off the coast which forms the Donna Nook National Nature Reserve (NNR) (Natural England, 2010). The site supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds along the lowland open waters. Wintering waterfowl and passage waders are widely distributed throughout the estuary. The distribution of species reflects the varying habitats and species ecology across the site. The sandy sediments of the outer estuary are populated by assemblages of knot and grey plover, while the upper estuary is characterised by large concentrations of wigeon. The Humber Estuary also supports a breeding bird assemblage across the open waters in the lowlands, including nationally important numbers if bitten, marsh harrier, avocet and bearded tit. Breeding avocets were first recorded at the site in 1992 and in recent years numbers of the species have sustainably increased. The majority of the assemblage are found in concentrations within the lagoons, clay pits and reedbeds at Far Ings (Natural England, 2023).	**Non-Breeding** Avocet (*Recurvirostra avosetta*) Bar-tailed godwit (*Limosa lapponica*) Bittern (*Botaurus stellaris*) Dark-bellied brent goose (*Branta bernicla bernicla*) Curlew (*Numenius arquata*) Dunlin (*Calidris alpina*) Golden plover (*Pluvialis apricaria*) Goldeneye (*Bucephala clangula*) Greenshank (*Tringa nebularia*) Grey plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Lapwing *(Vanellus vanellus*) Oystercatcher *(Haematopus ostralegus*) Pochard (*Aythya farina*) Redshank (*Tringa tetanus*) Ringed plover (*Charadrius hiaticula*) Ruff (*Philomachus pugnax*) Sanderling (*Calidris alba*) Shelduck (*Tadorna tadorna*) Wigeon (*Anas Penelope*) Teal (*Anas crecca*) Scaup (*Aythya marila*) Turnstone (*Arenaria interpres*) Whimbrel (*Numenius phaeopus*) Breeding bird assemblages
Saltfleetby – Theddlethorpe Dunes SSSI	Overlaps for 0.34 km	The Saltfleetby to Theddlethorpe Dunes SSSI is a nationally important site which compromises of salt and freshwater marshes, flats and dunes. These habitats support a variety of rich flora and fauna. There are outstanding assemblages of invertebrates, vascular plants and breeding birds, and it is the most north-easterly breeding site in the UK for the Natterjack Toad. The extensive intertidal sands and mudflats provide perfect grounds for feeding and roosting waterfowl and waders including shelduck, dunlin and brent geese. Saltmarsh communities in succession dominate the area and attract yellow wagtails which breed on the marsh and a small colony of little tern on the shingle bank (Natural England, 1981).	**Breeding** Little Tern (*Sterna albifrons*) **Non-Breeding** Dark-bellied brent Goose (*Branta bernicla bernicla*) Dunlin (*Calidris alpina alpina*) Knot (*Calidris canutus*) Redshank (*Tringa tetanus*) Sanderling (*Calidris alba*) Wigeon (*Anas Penelope*) No-breeding waterbirds
Lincolnshire Coronation Coast NNR (Previously known as Saltfleetby – Theddlethorpe Dunes NNR)	Overlaps for 0.34 km	The Lincolnshire Coronation Coast NNR is an important reserve which contains tidal sands and mudflats, salt and freshwater marshes and sand dunes. The site spans over 951 hectares. On the foreshore, accreting mud and silt flats and saltmarsh in the north give way to a narrower sandy beach at the southern end. The sand dunes are also much wider in the north and there is an extensive freshwater marsh between two dune ridges, which converge into a narrower	**Breeding** Little Tern (*Sterna albifrons*) **Non-Breeding** Dark-bellied brent Goose (*Branta bernicla bernicla*) Dunlin (*Calidris alpina alpina*) Knot (*Calidris canutus*) Redshank (*Tringa tetanus*)

Designated site	Distance from Scoping Boundary * (km)	Site description	Protected feature
		ridge south of Churchill Lane at Theddlethorpe (Lincs Wildlife Trust, 2023).	Sanderling (*Calidris alba*) Wigeon (*Anas Penelope*) Non-breeding waterbirds

*This is the nearest distance to the Scoping Boundary.

26.4.11 It should be noted that the HRA Screening considers that the following sites should also be considered based on the foraging ranges of their protected species. These sites will be considered as part of the EIA.

Table 26-7: Additional sites to be considered based on HRA Screening

Note: species whose foraging ranges will not result in an overlap with the Study Area have been greyed out.

Designated site	Distance from Scoping Boundary * (km)	Protected species
Flamborough and Filey Coast SPA [UK9006101]	21.6 km	• Razorbill (*Alca torda*), (Breeding) • Gannet (*Morus bassanus*), (Breeding) • Kittiwake (*Rissa tridactyla*), (Breeding) • Guillemot (*Uria aalge*), (Breeding) • Seabird assemblage (Breeding)
Northumberland Marine SPA [UK9020325]	23.2 km	• Arctic tern (*Sterna paradisaea*) • Common tern (*Sterna hirundo*) • Guillemot (*Uria aalge*) • Little tern (*Sterna albifrons*) • Puffin (*Fratercula arctica*) • Roseate tern (*Sterna dougallii*) • Sandwich tern (*Thalasseus sandvicensis*) • Seabird assemblage
Farne Islands SPA [UK9006021]	30.7 km	• Arctic tern (*Sterna paradisaea*), (Breeding) • Common tern (*Sterna hirundo*), (Bredding) • Guillemot (*Uria aalge*), (Breeding) • Roseate tern (*Sterna dougallii*), (Breeding) • Sandwich tern (*Thalasseus sandvicensis*), (Breeding) • Seabird assemblage, (Breeding)

*This is the nearest distance to the Scoping Boundary.

26.4.12 Any relevant transboundary sites will also be taken into consideration as part of the HRA and EIA.

Species Seasonality

26.4.13 There are three regular patterns of species occurrence in the UK: resident, summer visitors (breeding) and winter visitors (non-breeding) (BEIS, 2022). Table 26-8 provides information on the seasonality of each species listed as a qualifying feature of the designated sites identified above. Information on seasonality has been recorded from Natural England's Designated Sites view Site Search (naturalengland.org.uk) and the Humber Estuary Low Tide

Programme (2013). Where seasonality between sites differs, all months where species presence is noted has been identified. Species seasonality has only been considered for marine birds. Species not considered to be marine birds including lapwing (*Vanellus vanellus*), hen harrier (*Circus cyaneus*), bittern (*Botaurus stellaris*) and marsh harrier (*Circus aeruginosus*) have not been included in the seasonality table.

Table 26-8: Species seasonality for designated sites

Key	Annex I Species			Non-Annex I Species	

Protected species	Site	Sensitivity	Seasonality J	F	M	A	M	J	J	A	S	O	N	D
Avocet (*Recurvirostra avosetta*)	Humber Estuary SPA	Breeding												
Avocet (*Recurvirostra avosetta*)	Humber Estuary SPA	Non-breeding												
Bar-tailed godwit (*Limosa lapponica*)	Humber Estuary SPA, Ramsar and SSSI	Non-breeding												
Bittern (*Botaurus stellaris*)	Humber Estuary SPA and SSSI	Non-breeding												
Black-tailed godwit (*Limosa limosa islandica*)	Humber Estuary SPA and Ramsar	Non-breeding												
Common scoter (*Melanitta nigra*)	Greater Wash SPA	Non-breeding												
Common tern (*Sterna hirundo*)	Greater Wash SPA	Breeding												
Curlew (*Numenius arquata*)	Humber Estuary SSSI	Non-breeding												
Dark-bellied brent Goose (*Branta bernicla bernicla*)	Saltfleetby – Theddlethorpe Dunes SSSI and NNR, Humber Estuary SSSI	Non-breeding												
Dunlin (*Calidris alpina alpina*)	Humber Estuary SPA, Ramsar and SSSI, Saltfleetby – Theddlethorpe Dunes SSSI and NNR	Non-breeding												
Golden plover (*Pluvialis apricaria*)	Humber Estuary SPA, Ramsar and SSSI	Non-breeding												
Goldeneye (*Bucephala clangula*)	Humber Estuary SSSI	Non-breeding												
Greenshank (*Tringa nebularia*)	Humber Estuary SSSI	Non-breeding												
Grey plover (*Pluvialis squatarola*)	Humber Estuary SSSI	Non-breeding												
Knot (*Calidris canutus*)	Humber Estuary SPA, Ramsar and SSSI, Saltfleetby – Theddlethorpe Dunes NNR	Non-breeding												
Little gull, (*Hydrocoloeus (Larus) minutus*)	Greater Wash SPA	Non-breeding												
Little tern (*Sterna albifrons)*	Humber Estuary SPA, Greater Wash SPA, Humber Estuary SPA, Saltfleetby – Theddlethorpe Dunes SSSI and NNR	Breeding												
Oystercatcher *(Haematopus ostralegus*)	Humber Estuary SSSI	Non-breeding												
Pochard (*Aythya farina*)	Humber Estuary SSSI	Non-breeding												
Redshank (*Tringa tetanus*)	Humber Estuary SPA, Ramsar and SSSI, Saltfleetby – Theddlethorpe Dunes SSSI and NNR	Non-breeding												

Protected species	Site	Sensitivity	Seasonality											
			J	F	M	A	M	J	J	A	S	O	N	D
Ringed plover (*Charadrius hiaticula*)	Humber Estuary SSSI	Non-breeding												
Ruff (*Calidris pugnax*)	Humber Estuary SPA and SSSI	Non-breeding												
Red-throated diver (*Gavia stellata*)	Greater Wash SPA	Non-breeding												
Sanderling (*Calidris alba*)	Saltfleetby – Theddlethorpe Dunes SSSI and NNR, Humber Estuary SSSI	Non-breeding												
Sandwich tern (*Thalasseus sandvicensis*)	Greater Wash SPA	Breeding												
Shelduck (*Tadorna tadorna*)	Humber Estuary SPA, Ramsar and SSSI	Non-breeding												
Scaup (*Aythya marila*)	Humber Estuary SSSI	Non-breeding												
Turnstone (*Arenaria interpres*)	Humber Estuary SSSI	Non-breeding												
Teal (*Anas crecca*)	Humber Estuary SSSI	Non-breeding												
Wigeon (*Anas Penelope*)	Saltfleetby – Theddlethorpe Dunes SSSI and NNR, Humber Estuary SSSI	Non-breeding												
Whimbrel (*Numenius phaeopus*)	Humber Estuary SSSI	Non-breeding												

Sensitive Receptors

26.4.14 Species identified as sensitive receptors are likely to form the main focus of the EIA. These include Annex I species for which sites are designated, as well as those which are considered to be particularly sensitive to disturbance due to factors such as their abundance, particular biological characteristics, and susceptibility to disturbance. A number of marine birds may be impacted by underwater noise pressures that result from visual disturbances caused by vessel traffic or changes in water clarity affecting the ability of the birds to forage successfully.

26.4.15 Whilst seaducks (such as shelduck) and waders are considered to be sensitive to noise and visual disturbance, divers, grebes and mergansers are considered highly sensitive to noise and visual disturbance, such as that caused by vessel traffic (Atterbury *et al.,* 2021). Inshore activities at the intertidal zone and those at the location of the cable Landfall, will disturb waders who spend large portions of time in those areas (Fliessbach *et al.,* 2019). Terns, gulls, kittiwakes and gannets are considered to have low to moderate sensitivity to noise and visual disturbance. Species which plunge dive for prey e.g., divers and terns are sensitive to changes in water clarity which impedes the ability to locate prey species.

26.5 Proposed Assessment Methodology

26.5.1 The intertidal and offshore ornithology EIA will follow the assessment approach set out in Part 3, Chapter 21 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach.

26.5.2 The results from studies completed to inform other topics e.g., sediment dispersion modelling, sandeel and Atlantic herring habitat assessment will be used to establish the potential significance of impacts on ornithology receptors.

26.5.3 Where impacts are not predicted to be significant, simple assessments, using an evidence-based approach that is proportionate to the anticipated level of significance will be undertaken. Where potentially significant impacts are identified, consultation will be undertaken with statutory nature conservation bodies to agree proportionate and effective mitigation, and residual effects will be presented.

26.5.4 The Intertidal and Offshore Ornithology EIA will be prepared in accordance with relevant EIA guidance and industry best practice documents including National Infrastructure Planning advice notes; professional EIA guidance documents and Natural England Offshore wind cabling: ten years' experience and recommendations (Natural England, 2018). Most of the guidance on the potential impacts of offshore development on birds focuses on renewable energy generation. This guidance will be referred to where relevant and proportionate to the level of construction activity required for the installation of submarine cables.

26.6 Scope of Assessment

26.6.1 A range of potential impacts on intertidal and offshore ornithology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 26-9 describes the potential impacts identified and justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage the impact has been scoped into the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped 'out' of the EIA.

26.6.2 Where relevant, bird species have been grouped according to their sensitivity to disturbance or their method of feeding after Atterbury *et al*. (2021).

26.6.3 Whilst it is acknowledged that some purely onshore species may use the intertidal area for foraging, passage or loafing, the Projects will have very limited interaction with the intertidal area should the preferred method of using a trenchless technology (such as HDD) to install the cables within the intertidal area be used, however, some disturbance to species using the intertidal area may occur should open cut trenching be used. Works associated with the transition from offshore to onshore such as the trenching or HDD punch out and cable pull-in may require personnel and equipment on the intertidal area, but this will be limited in duration. Components such as a HDD compound are part of the scope of the English Onshore Scheme, of which the potential impacts will be assessed in the terrestrial environmental assessment.

Table 26-9: Scoping assessment of impacts on intertidal on offshore ornithology

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification: Construction	Scoping Justification: Operation (including repair and maintenance)	Scoping Justification: Decommissioning
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)*	Boulder clearance, PLGR, pre-sweeping of sand waves. HDD duct excavation. Open cut trenching Cable burial and trenching. Deposit of external cable protection.	Divers, grebes and mergansers	**IN –** Diving species such as red-throated divers dive for prey and rely on clear vision for success. A reduction in water clarity as a result of increased suspended solids in the water column following disturbance of seabed sediments (i.e., because of route clearance, seabed preparation, cable burial, deposition of external cable protection and repair/remediation works), could negatively impact foraging success. In addition, the deposition of suspended sediments from the water column has the potential to smother potential prey species which live on the sea floor, thus reducing prey abundance. As described in Chapter 23 Marine Physical Environment, there is evidence that any sediment plumes will be rapidly dissipated as result of natural current flow. In addition, the footprint of the Projects is sufficiently narrow such that a relatively small area of the seabed will be affected at any one time. This impact has been scoped in for divers, grebes and mergansers due to uncertainty regarding the extent of available feeding grounds and the potential for significant displacement during certain periods of the year.		
		Seaducks, geese and swans	**OUT –** Some species of sea ducks, geese and swans present in the designated sites as protected species are classified as 'diving ducks' according to the RSPB (2022), including eider, goldeneye and pochard. There are also species of surface feeders including shelduck, teal and wigeon that may on occasion 'shallow dive' in search of invertebrates, shellfish and aquatic snails. Therefore, there is potential for an adverse impact on their foraging abilities as a result of decreased water clarity. However, as described in Chapter 23 Marine Physical Environment, there is evidence that any sediment plumes are likely to be rapidly dissipated as result of natural current flow. In addition, the footprint of the Projects is sufficiently narrow such that a relatively small area of the seabed will be affected at any one time. Diving birds will therefore have sufficient alternative feeding grounds available and as a result are unlikely to be significantly adversely affected by a temporary reduction in water clarity.		
		Terns, gulls, kittiwakes and gannets	**IN –** Diving birds such as common tern and little tern, which are protected features across a number of designated sites in the Study Area, plunge dive for food and therefore there is potential for an adverse impact on their foraging abilities as a result of decreased water clarity. Kittiwake are particularly vulnerable to food shortages as a result of increased suspended sediments, as they can only take prey when it occurs near to the surface of the sea, unlike auks which have the ability to dive to greater depths for a variety of prey in the water column (Wanless et al., 2018). As described in Chapter 23 of this Scoping Report, there is evidence that any sediment plumes are likely to be rapidly dissipated as result of natural current flow. In addition, the footprint of the Projects is sufficiently narrow such that a relatively small area of the seabed will be affected at any one time. This impact has been scoped in for terns, gulls, kittiwakes and gannets due to uncertainty regarding the extent of available feeding grounds and the potential for significant displacement during certain periods of the year.		
		Harriers and Waders	**OUT –** Wading birds and harriers do not dive for food and are therefore very unlikely to be adversely affected by a decrease in water clarity as a result of increased suspended sediments during any stage of the Projects.		
Changes in distribution of prey species	Pre-sweeping of sand waves. Cable burial and trenching.	All species	**OUT –** Pre-sweeping of the seabed and the installation of the cable will cause a localised, temporary loss of habitat leading to a potential reduction in prey availability. However, these activities will take place over a relatively small area of the seabed, and there will be sufficient alternative foraging areas available. In addition, these activities are transient in nature. The seabed habitat will recover	**OUT –** Any pre-sweeping or cable maintenance required during the lifetime of the cable will be temporary and localised in nature. Such activities will not constitute a significant impact on prey availability due to their transience and small footprint.	**OUT -** It is expected that decommissioning activities will result in a lower magnitude effect than that already considered during installation.

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	Operation (including repair and maintenance)	Decommissioning
			and will continue to support prey species within the short-term. These activities are therefore not considered to significantly adversely affect the prey availability for bird species within the Study Area.		
	Deposit of external cable protection.	All species	**IN –** The deposition of cable protection will result in permanent alteration of affected areas of the seabed. This has the potential to reduce areas of habitat for prey species such as sandeel and herring and consequently reduce prey availability for bird species in the Study Area. Further assessment will be undertaken within the EIA to evaluate the sensitivity of relevant prey species to habitat alteration.	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that remedial external cable protection may be required in discrete locations which has the potential to reduce sandeel and herring habitat and therefore reduce prey availability.	**OUT –** No additional cable protection will be deposited for decommissioning therefore it can be scoped out.
Visual / physical disturbance or displacement	Presence of project vessels and equipment. Open cut trenching within the intertidal.	Divers, grebes and mergansers	**IN -** Diving species such as red-throated divers are recognised as being highly sensitive to noise and visual disturbance, such as that caused by vessel traffic (Atterbury *et al.,* 2021). Once flushed, they may not rapidly resettle. It is recommended that vessel transit through SPAs where these species are present should be avoided where possible. The extent of the potential impact of Projects' vessels during all phases of the Projects life cycle on diving species will be considered further as part of the EIA.		
		Seaducks, geese and swans	**IN –** Species present within this group such as shelduck are considered to be sensitive to noise and visual disturbance (Atterbury et al., 2021), and it is not known how rapidly they resettle following disturbance. The extent of the potential impact of Projects' vessels (especially at the landfall /intertidal area) during all phases of the Projects life on this group will be considered further as part of the EIA.		
		Terns, gulls, kittiwakes and gannets	**OUT –** These species are considered to be low to moderately sensitive to noise and visual disturbance (Atterbury et al., 2021). It is not considered that the presence of the Projects vessels are likely to have a significant impact on this group.		
		Harriers and Waders	**IN –** These species are considered to be sensitive to noise and visual disturbance (Atterbury et al., 2021). Although they are largely present within the intertidal areas rather than offshore, there is the potential for them to be disturbed if open cut trenching is used in the intertidal and due to vessel traffic during works in close proximity to the proposed Landfall and intertidal area. The extent of any potential impact on these species will be considered further as part of the EIA.		
Accidental spills *(Hydrocarbon & PAH contamination)*	Presence of project vessels and equipment.	All species	**OUT –** Projects' vessels and contractors will 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 Shipboard Oil Pollution Emergency Plan (SOPEP). Compliance with Regulations will be sufficient to minimise the risk to the environment.		

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27. Marine Mammals and Marine Reptiles

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27. Marine Mammals and Marine Reptiles

27.1 Study Area Definition

27.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Projects on marine megafauna receptors including marine mammals (Eurasian otter, cetaceans[4], pinnipeds[5]) and marine turtles (chelonians[6]).

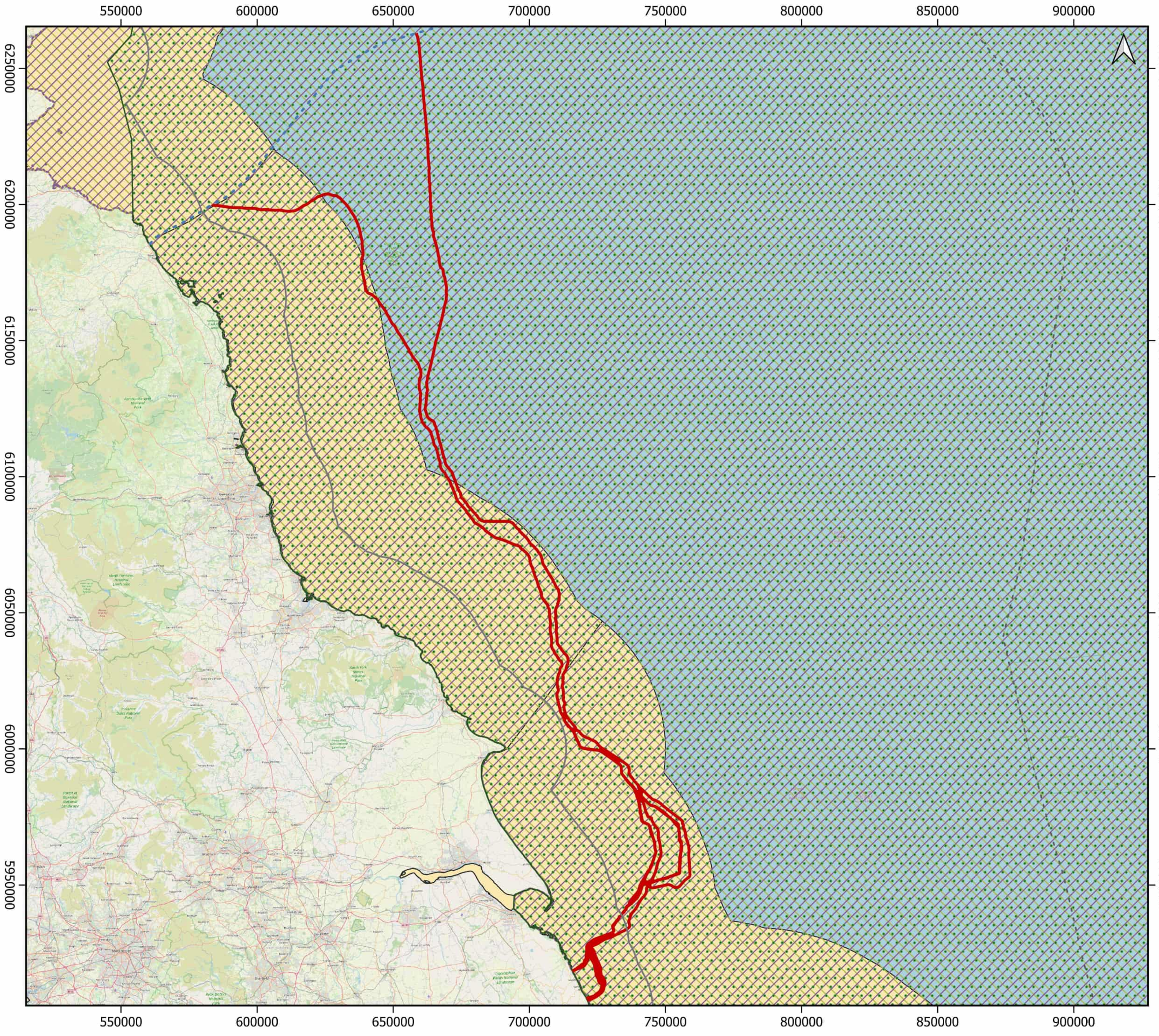
27.1.2 The Study Area has been defined for each species based on the mobility of the species and its geographic extent, as outlined in Table 27-1. This is a precautionary maximum zone of influence that will be reviewed and refined for the EIA based on the final project description and the conclusions of Part 3, Chapter 23 – Marine Physical Processes.

Table 27-1: Study Area for marine mammals and marine reptiles

Receptor	Extent of Study Area	Justification
Cetaceans (porpoises, dolphins and whales)	Management Units (MUs)	Most cetaceans are wide-ranging, and individuals encountered within the North Sea form part of a much larger biological population whose range extends into the North Atlantic and North-West European waters. MUs have been agreed by the UK SNCBs for seven of the common regularly occurring species, which provide an indication of the spatial scales at which effects of anthropogenic activities should be taken into consideration (IAMMWG, 2023). The relevant MUs have been used to define the Study Area. Figure 27-1 (Drawing C01494-EGL3&4-SPEC-011) illustrates the spatial scale of the management unit through which the Projects pass.
Pinniped Grey seal (*Halichoerus gryphus*)	Assessment Units: South-East England, North-East England.	It is estimated that grey seal forage up to 100 km from haul-out sites on the coast. Telemetry data indicates that there is exchange of grey seals between colonies in the Netherlands, France, England, Wales, Scotland and Ireland (OAP, 2022).
Pinniped Harbour seal (*Phoca vitulina*)	50 km radius from Landfall and coastline	Harbour seals are not known to make trips greater than 50 km from haul out sites (OAP, 2022).
Eurasian otter (*Lutra lutra*)	Up to 40 km along the coast	Forage in a narrow zone close to the shore (<100 m) (Gov.uk, 2022).

[4] Cetaceans include whales, dolphins and porpoises.
[5] Pinnipeds include seals, sea lions and walruses.
[6] Chelonians include sea turtles.

Receptor	Extent of Study Area	Justification
Chelonians Sea turtles	North Sea	Chelonians are wide ranging and infrequent visitors to UK waters.



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Marine Mammal Management Units

C01494-EGL3&4-SPEC-011-B

- - - Exclusive Economic Zone Limit (EEZ)
— 12NM Limit
- - - Scottish Adjacent Waters
Scoping Boundary

Marine Mammal Management Units
North Sea (Harbour Porpoise)
Greater North Sea (Bottlenose Dolphin)
Celtic and Greater North Sea (Short-beaked Dolphin, White-beaked Dolphin and Minke Whale)
OSPAR Seal Indicator Assessment Units

0 10 20 NM

0 25 50 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,350,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

Document Path: X:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3&4\08_SPEC\C01494_EGL3&4_SPEC_011.qgz

Export Date: 09/07/2024

27.2 Data Sources

27.2.1 Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

27.2.2 Extensive contemporary and historic information is available regarding abundance and distribution of marine mammals and marine reptiles in the North Sea. Following a detailed review to inform the scope of the data and assessment, as presented, no site-specific surveys are planned for this topic.

Publicly Available Data

27.2.3 Desk based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Table 27-2 lists the key data sources which will be used in the assessment.

Table 27-2: Key publicly available data sources for marine mammals and marine reptiles

Data Source	Description
NE	Natural England Conservation Advice for Marine Protected Areas in England
JNCC	JNCC Conservation Advice for Marine Protected Areas
MMO – Marine Activity Data	An interactive tool that enables access to spatial information relating to the marine environment in England
Magic Maps	An interactive mapping system developed by Defra that holds spatially referenced data on the natural environment for England
DECC (2022)	Offshore Energy Strategic Environmental Assessment (OESEA4)
Reid *et al.* (2016)	Atlas of cetacean distribution in northwest European waters
Hammond *et al.* (2021)	Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III
Gilles *et al.* (2023)	Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys
Joint Cetacean Data Programme (JCDP) (2022)	Portal collating at-sea effort-related data collected via ship-based or aerial methods, under the JCDP.
Heinanen and Skov (2015)	The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area
Russell *et al.* (2017)	Updated seal usage maps: The estimated at-sea distribution of grey and harbour seals
Sea Watch Foundation	Sea Watch Foundation sightings data
The Marine Life Information Network (MarLIN, 2023)	Species Information
National Biodiversity Network Gateway http://data.nbn.org.uk/	Occurrence records for marine turtles, cetaceans, pinnipeds and Eurasian otter.

Data Source	Description
Waggitt *et al*. (2020)	Distribution maps of cetacean and seabird populations in the North-East Atlantic
Hague *et al.* (2020)	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)	UK seals monitoring programme – annual report 2022 (or subsequent update if released)
Carter *et al*. (2020)	Habitat-based predictions of at-sea distribution for grey and harbour seals in the British Isles
Reeds (2004)	Provides a summary of turtle distribution data supplied by the Ocean Biodiversity Information Systems (OBIS)
Crawford (2010)	Fifth otter survey of England 2009 – 2010
IAMMWG (2023)	Updated abundance estimates for cetacean Management Units in UK waters. JNCC Report No. 734.
Offshore Wind Farm Aerial Surveys	Offshore Wind Farms 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 will be sought from the projects consent applications to inform the baseline: • Hornsea Three, • Dogger Bank A Other applications will be monitored to see if any developments at the pre-consent phase release relevant information which can be used. Examples may include Dogger Bank South.

Additional Studies

Electromagnetic Field (EMF) Study

27.2.4 A study will be undertaken to calculate the predicted electromagnetic fields to be generated by the submarine electricity cables due to the electric current flowing along the cables. The electric and magnetic field strengths would be highest where the cables are separated and/or partially unburied. The study would therefore focus on determining the maximum field strengths and the distance at which the fields dissipate to background values. This study would be used to determine the spatial extent over which electromagnetic changes could affect sensitive receptors including how they navigate.

Underwater Noise Modelling

27.2.5 An underwater noise modelling study will be undertaken to understand the potential impacts of underwater noise occurring as a result of the Projects on marine receptors, including marine mammals and reptiles. The modelling will take into account the noise sources, injury and disturbance thresholds for each receptor considered and the distances at which sound attenuates to below the relevant thresholds for each receptor, both with and without mitigation. Sound propagation can be modelled in a variety of ways from simple calculations assuming spreading according to set principles to full acoustic models. The scope and approach to the modelling will be proportionate to the activities to be undertaken noting that different approaches may be used for different activities. The scope and approach will be agreed with JNCC, Cefas and NE.

27.3 Consultation

27.3.1 The scope of the marine mammals and marine reptiles chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 27-3 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 27-3: Summary of responses received during previous consultation

Organisation	Summary of response received	Response
Cefas	Cefas Underwater Noise Team recommend that underwater noise impacts are further considered within the EIA.	Please see Table 27-6.
JNCC	A new potential impact of 'seabed loss' should be scoped in due to the response from JNCC for reasoning that in Chapter 8 temporary and permanent habitat loss of shellfish and marine species with a demersal life stage were both scoped in so this work should link with discussions of CO3 of the SNS SAC where appropriate.	Please see Table 27-6.
Natural England	NE advise that the Teesmouth and Cleveland Coast SSSI and NNR common / harbour seal population are screened into the EIA.	Please see Section 27.4.2
Natural England	Natural England has advised the Project to reference the following: • IAMMWG (2022). Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022) Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022) (jncc.gov.uk) • Scientific Advice on Matters Related to the Management of Seal Populations: 2021 http://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf • Carter et al. (2022) https://www.frontiersin.org/articles/10.3389/fmars.2022.875869/ful	The following references have been mentioned throughout the chapter and will be used for the PEIR and ES.

27.3.2 Further consultation to inform the PEIR will be undertaken with relevant stakeholders to supplement the desk-top review and studies. The following bodies will be consulted, at a minimum, to ensure that the most up-to-date information is collated:

- JNCC
- Cefas

- NE

27.4 Baseline Characterisation

General Species Information

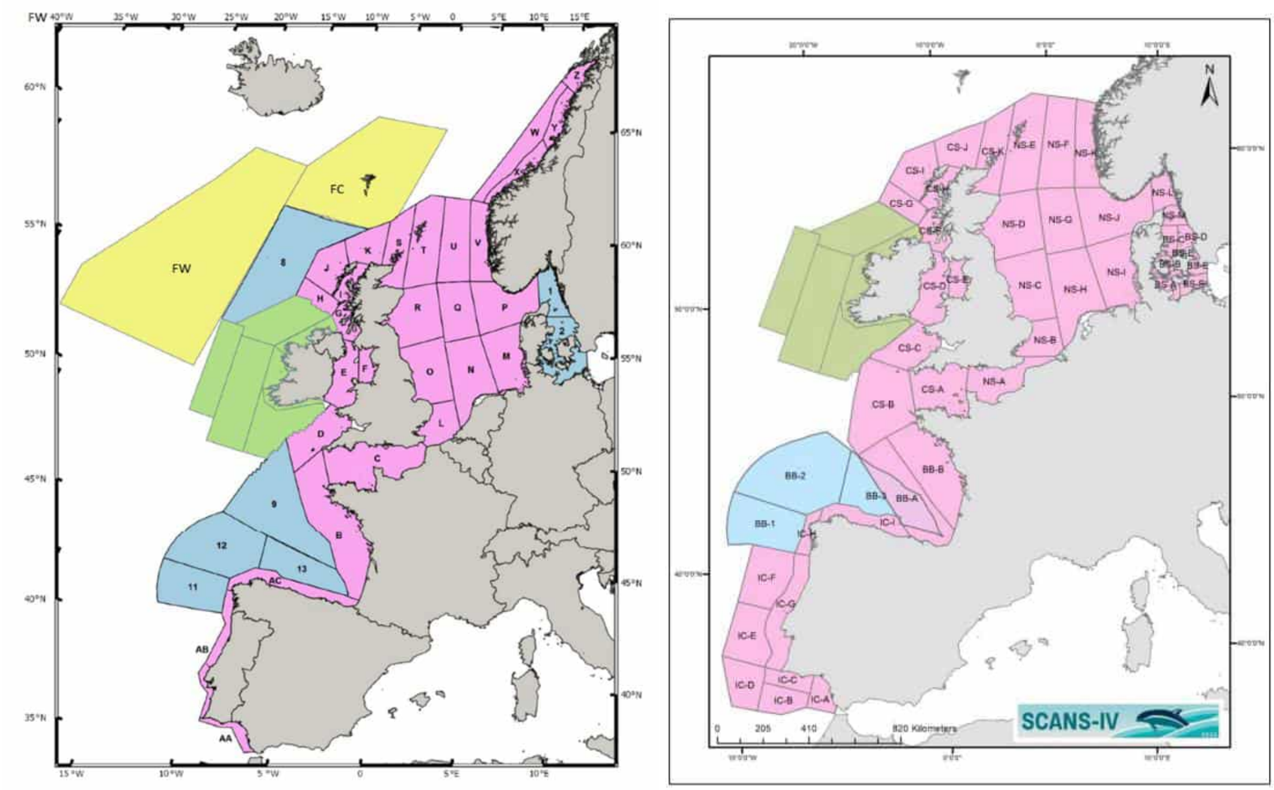
Overview

27.4.1 Large scale surveys to monitor the cetacean population size have been carried out in UK Waters by Small Cetacean Abundance in the European Atlantic and North Seas (SCANS) and Cetaceans Offshore Distribution and Abundance in the European Atlantic (CODA). Surveys were carried out in 1994, 2005, 2016 and 2022 by SCANS and 2007 for CODA. The Projects pass through survey Block O and R as designated in the SCANS III survey and renamed respectively Block NS-C and NS-D in the SCANS IV survey. Figure 27-2 illustrates the survey blocks used in the 2016 SCANS III survey and the 2022 SCANS IV survey.

27.4.2 The data showed that twenty-eight cetacean species have been recorded in UK waters, however, only eleven species are considered to be regular visitors. The other recorded species are rare occasional visitors (DECC, 2022). Compared to other parts of the UK continental shelf, the North Sea has relatively low densities and numbers of species recorded.

27.4.3 The Sea Mammal Research Unit (SMRU) at the University of St Andrews provide annual reports on the state of the UK Seal populations through the Special Committee on Seals (SCOS). The most recently published report (dated 2021) reviewed data from between 2016 and 2019 for the two species of seal, harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) (SCOS, 2022). This data showed an overall increase in the grey seal population between 2016 and 2019 of <1.5% in England, however, there has been a decline in the population of harbour seal of up to 38% in some English waters.

Figure 27-2: Left image - SCANS III survey blocks – blue areas surveyed by vessel and pink areas surveyed by air (from Hammond et al., 2021) Right image – SCANS IV survey blocks – blue areas surveyed by vessel and pink areas surveyed by air (from Gilles et al. 2023)



Sightings Data

Cetaceans, pinnipeds and marine turtles

27.4.4 Table 27-4 lists recent marine mammal sightings within the Study Area along with their relevant MU, seasonality and frequency. Five data sources have been used to compile Table 27-4:

- Sea Watch Foundation - an organisation which collates sightings data from scientists and members of the public. Sightings for a rolling twelve-month period are typically publicly available. This Scoping Report references data available at the time of writing: March to August 2023. As SeaWatch is a voluntary organisation it does not follow standard data periods.
- National Biodiversity Network (NBN) Atlas - holds species data back to the 1900s for some species. Data for the period 2018 to 2022 was used for this Scoping Report.
- Data has been reviewed from two recent OWF projects where aerial marine mammal surveys have been undertaken, namely Hornsea 3 OWF (surveys between 2016 to 2017) and Dogger Bank (survey in 2013).
- The species density estimates are taken from the SCANS III survey undertaken in 2016 and the SCANS IV survey undertaken in 2022. The Projects pass through SCANS III survey Blocks O and R and SCANS IV survey Blocks NS-C and NS-D (see Figure 27-2).

Table 27-4: Species and Sightings within the Study Area

Species	Relevant MU	Seasonality	Frequency	Sightings Data				
				Density estimate (individuals per km^2)		SeaWatch Foundation Sightings Mar -Aug 2023 *	NBN Atlas – Sighting 2020 - 2022†	OWF observations
				2016 ^	2022			
Harbour porpoise	North Sea	All year	Common	Block O – 0.888 Block R 0.599	NS-C – 0.6027 NS-D – 0.5985	23 sightings with a max group size of 10	21 sightings	1007 sightings in 20 months ** 365 sightings in 2 months #
Short-beaked common dolphin	Celtic and Greater North Sea	Summer	Occasional	-	NS-C – 0.0032	3 sightings with a max group size of 10	-	-
Bottlenose dolphin	Greater North Sea	All year	Occasional	Block R 0.0298 individuals per km^2	NS-C – 0.0419	71 sightings with a max group size of 18	14 sightings	-
White-beaked dolphin	Celtic and Greater North Sea	Summer	Occasional	Block O – 0.002 Block R 0.243	NS-C – 0.0149 NS-D - 0.0799	3 sightings with a max group size of 50	-	5 sightings in 20 months ** 5 sightings in 2 months #
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	3 sightings with a max group size of 1	7 sightings	1 sighting in 20 months ** 16 sightings in 2 months #
Humpback whale	n/a	-	Rare	n/a	-	2 sightings with a max group size of 1	-	-
Fin Whale	n/a		Rare	n/a	NS-D – 0.0009	-	-	-
Grey seal	n/a	-	Common	-	-	3 sightings with a max group size of 6	46 sightings	6 sightings in 20 months *
Harbour (Common) seal	n/a	-	Common	-	-	1 sighting with a max group size of 1	13 sightings	1 sighting in 20 months *
Leatherback turtle	n/a	-	Rare	-	- NS-D – 0.5985	-	4 sightings since 1998	-

Sources:
^ Hammond et al (2021) * (Seawatch, 2023) † (NBN, 2023) ** (Orsted, 2018) # (WUR.nl, 2014) + Gilles et al (2023)

Cetaceans

Harbour porpoise (Phocoena phocoena)

27.4.5 The harbour porpoise is widespread around the UK. It is the smallest and most common cetacean found within the north-western European continental shelf waters. It is the most populous cetacean species in the North Sea.

27.4.6 Individuals can grow up to 1.6 m in length with the females often slightly larger than the males. Typically, they are found in small groups of 1 to 3 animals. They generally appear shy, avoiding other species and rarely interact with boats. Due to their size and nature, they are typically difficult to spot for survey purposes.

27.4.7 Though the harbour porpoise has been recorded all year round, they are more common in the summer when they move closer to the shoreline to breed. Individuals also tend to move further north during the summer months so are more frequently recorded in the Study Area during winter (Hammond *et al.,* 2021).

27.4.8 The harbour porpoise mating season lasts from April to September (peaking in July and August). Calves are born between May and August (breeding season peaks in June). Recent sighting data for this species are shown in Table 27-4.

Short-beaked common dolphin (Delphinus delphis)

27.4.9 The short-beaked common dolphin is easily identified at sea by the light-coloured hour-glass pattern on their lower flanks. This species can grow up to 2.4 m in length (MarLIN, 2022). They commonly breach and often bow-ride. Average group sizes observed are between 6 and 10 individuals, though large schools have been frequently recorded.

27.4.10 Although commonly seen off the west coast of Britain and Ireland they are only occasionally observed in the North Sea, mainly during the summer (June to September) (DECC, 2022). Recent sighting data for this species are shown in Table 27-4.

White-beaked dolphin (Lagenorhynchus albirostris)

27.4.11 The white-beaked dolphin is recognisable by its short, often white, beak. It can grow up to 3.2 m in length (MarLIN, 2022a). This species frequently displays forward, vertical or side breaches and frequently bow-ride vessels. This species is also known to mix with other dolphins and whales to assist in co-operative food herding.

27.4.12 The white-beaked dolphin occurs over a large part of the northern European continental shelf and is frequently recorded in the central and northern North Sea but is only occasionally observed in the southern North Sea. Whilst present all year round it has been most frequently observed between June and October (DECC, 2022). Recent sighting data for this species are shown in Table 27-4.

Bottlenose dolphin (Tursiops truncatus)

27.4.13 The bottlenose dolphin is the largest dolphin which frequents British waters, growing up to 4 m. They often display forward to sideways breaches, somersaults and tail slaps and frequently bow-ride. Like the white-beaked dolphin it is frequently seen mixing with other species. Group sizes are regularly between 2 and 25 animals, but individuals can travel in much larger groups, although this is most common in deep water (DECC, 2022).

27.4.14 There are resident populations of this species in Cardigan Bay, Wales and the Moray Firth, Scotland but animals are occasionally sighted in the North Sea (MarLIN, 2022b). Recent sighting data for this species are shown in Table 27-4.

Minke whale (Balaenoptera acutorostratache)

27.4.15 The minke whale is the most common and widely distributed of the baleen whales in British waters. They are recorded throughout the northern and central North Sea but are rare visitors in the southern North Sea (DECC, 2022).

27.4.16 The minke whale is one of smallest of the baleen whales, their length averages 8.5 m. Spy hopping and breaching are common for this whale which tend to form groups of about three animals (MarLIN 2022c). Although the species occurs year-round most sightings have been recorded between May and September (JNCC, 2003). Recent sightings data for this species is shown in Table 27-4.

Humpback whale (Megaptera novaeangliae)

27.4.17 Humpback whales are present worldwide in tropical, temperate and polar seas of both hemispheres, typically favouring waters over and along the continental shelf edge and around oceanic islands. They migrate annually from high latitude, cold water, feeding grounds in summer to low-latitude, warm water, breeding grounds in winter. They are usually observed singly or in pairs and groups rarely exceed 4 or 5 individuals when not feeding or breeding. Humpback whale populations, including those in the North Atlantic, had been severely depleted by over-exploitation (DECC, 2022) however since the introduction of legal protection in 1955 their abundance has increased (Stevick *et al.,* 2003). They are considered occasional visitors to UK waters.

27.4.18 The humpback whale is a baleen whale and can reach up to 16 m in length. It is a member of the rorqual family with the characteristic ventral pleats of skin under the eye and the relatively flat and broad jaw. At close range, it is one of the easiest whales to identify. It has extremely long distinctive flippers with a white colouration and knobs on the leading edge. The dorsal fin is low and usually sits on a hump. The head has a single ridge and is covered with numerous bumps. It is a grey-black colour dorsally and laterally and is white underneath (MarLIN, 2008). Recent sightings data for this species is shown in Table 27-4.

Fin whale (Balaenoptera physalus)

27.4.19 The fin whale is a baleen whale. It is a slender bodied whale and can reach up to 24 m in length. The small flippers are less than one-fifth of the body length. The fin whale has a dark dorsal and lateral colouration with light streaks and the belly is white. The left side of the head is grey, while much of the right side is white in colour. The fin whale is an open ocean whale, not often seen near the coast in north-west Europe. It can be found at the surface or diving down to over 230 m in depth. It is only occasionally seen of the coasts of north and north-western Scotland and southern Ireland (MarLIN, 2008a). Recent sightings data for this species is shown in Table 27-4.

Other Cetaceans

27.4.20 There have been no recorded sightings of the following cetaceans within the Study Area:

- Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
- Risso's dolphin (*Grampus griseus*)
- Long-finned pilot whale (*Globicephala melas*)
- Killer whale (*Orcinus orca*)
- Northern bottlenose whale (*Hyperoodon ampullatus*)
- Sperm whale (Physeter macrocephalus)

Pinnipeds

Grey seal (Halichoerus grypus)

27.4.21 Grey seals, the larger of the two species of seal in the UK, spend most of their time at sea only coming to shore in autumn to form breeding colonies. They are amongst the rarest seals in the world and the UK population represents 36% of the global grey seal population (JNCC, 2022). Grey seals prefer to use remote islands, bays and caves as ‘haul out’ areas to give birth to their pups but also between foraging trips for food.

27.4.22 Grey seals are mainly distributed around and between haul-out sites and foraging areas and are more commonly seen in the central and northern North Sea. Foraging areas can be up to 100 km offshore and are generally connected to haul-out sites by a corridor of higher use (DECC, 2016).

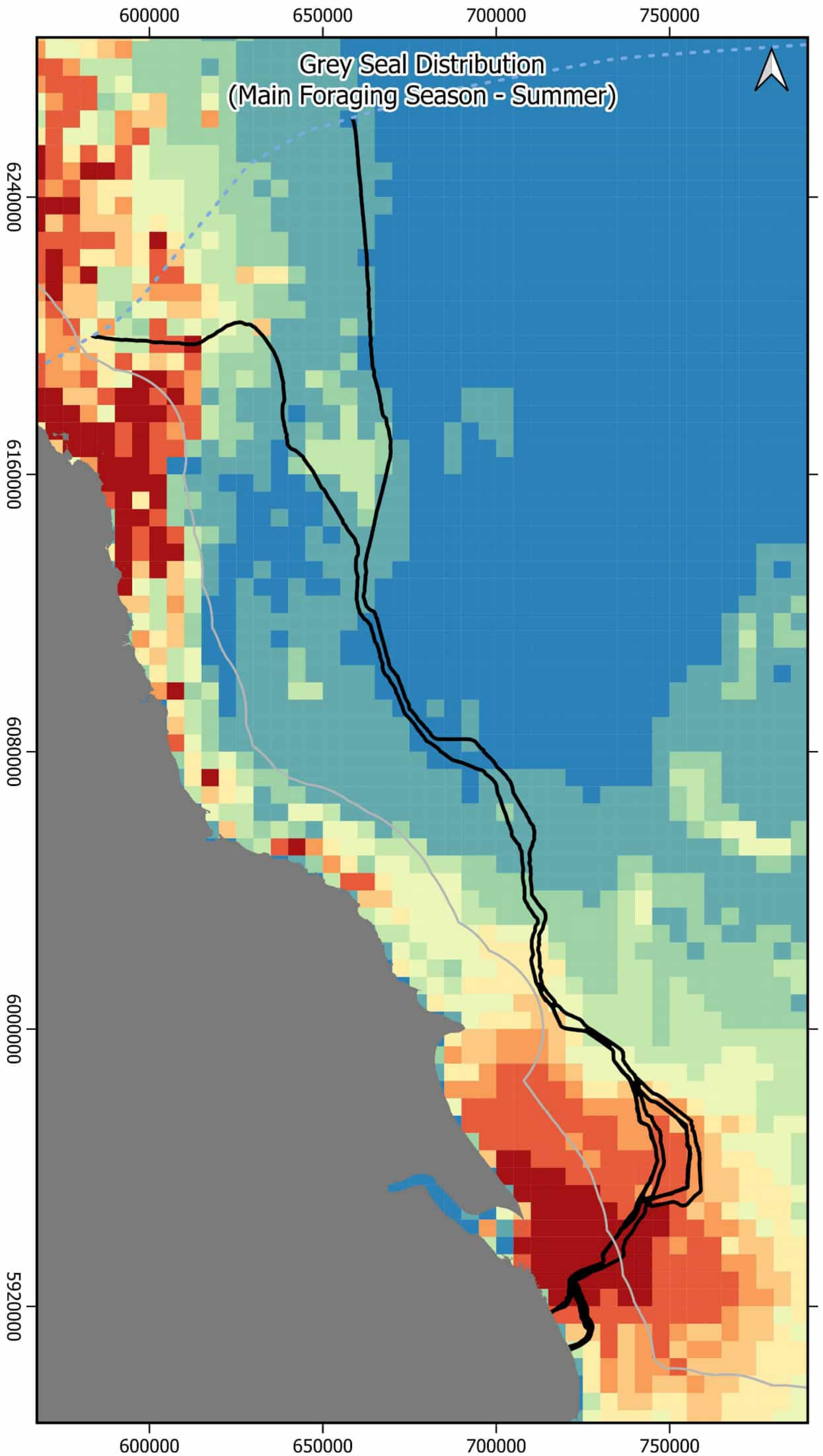
27.4.23 Breeding takes place in the autumn, with a gestation period of 11 months. Exact timings vary not only between years but also location. In eastern England pupping occurs between November and December. A large proportion of the grey seal population will be on land and in waters close to colonies for several weeks from October to December during the pupping and breeding season, and again in February and March during the annual moult. Densities at sea are likely to be lower during this period than at other times of the year (BEIS, 2022).

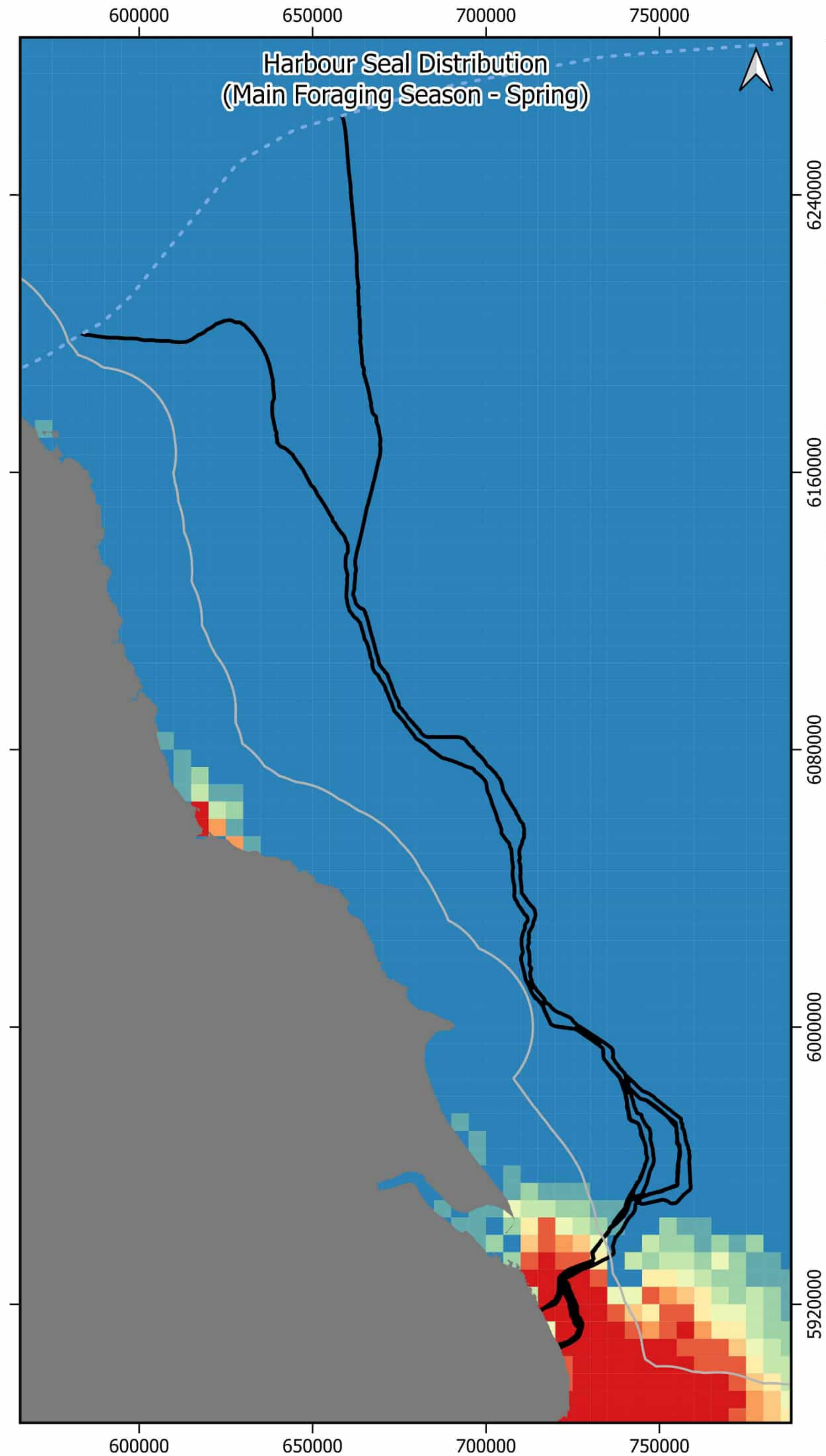
Harbour (Common) seal (Phoca vitulina)

27.4.24 The harbour or common seal is a species that 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 (JNCC, 2022a). Unlike the larger grey seal, the harbour seal foraging area is within 40 - 50 km of their haul out site.

27.4.25 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 (BEIS, 2022). Therefore, from June to September harbour seals are ashore more often than at other times of the year.

27.4.26 Figure 27-3 (Drawing C01494-EGL3&4-SPEC-012) illustrates the grey seal and harbour seal population density estimates within the Study Area.





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Grey Seal and Harbour Seal Densities

C01494-EGL3&4-SPEC-012-B

12NM Limit
Scottish Adjacent Waters
Scoping Boundary

Seal Density Distribution
(Mean % at Sea Population per 25km2)

- 0 - 0.0025
- 0.0025 - 0.005
- 0.005 - 0.0075
- 0.0075 - 0.01
- 0.01 - 0.0125
- 0.0125 - 0.015
- 0.015 - 0.0175
- 0.0175 - 0.02
- 0.02 - 0.03
- >=0.03

0 10 20 NM

0 10 20 KM

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
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Unit	Meters
Scale at A3	1:1,500,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Chelonians

Leatherback turtle (Dermochelys coriacea)

27.4.28 Although not indigenous to the UK, sea turtles are the only marine reptiles to be found in UK waters. The leatherback turtle is the most widely distributed turtle species and is the largest, growing up to 1.7 m in length, being found in all oceans except the Southern Ocean.

27.4.29 Within the North Atlantic its range extends from the tropics to the polar region right across to Europe’s north-easterly fringe (Seamap 2022).

27.4.30 Leatherback turtles are pelagic feeders and their presence in UK waters is part of this species’ wide-ranging migration in response to food distribution, notably jellyfish and other gelatinous zooplankton.

Eurasian Otter

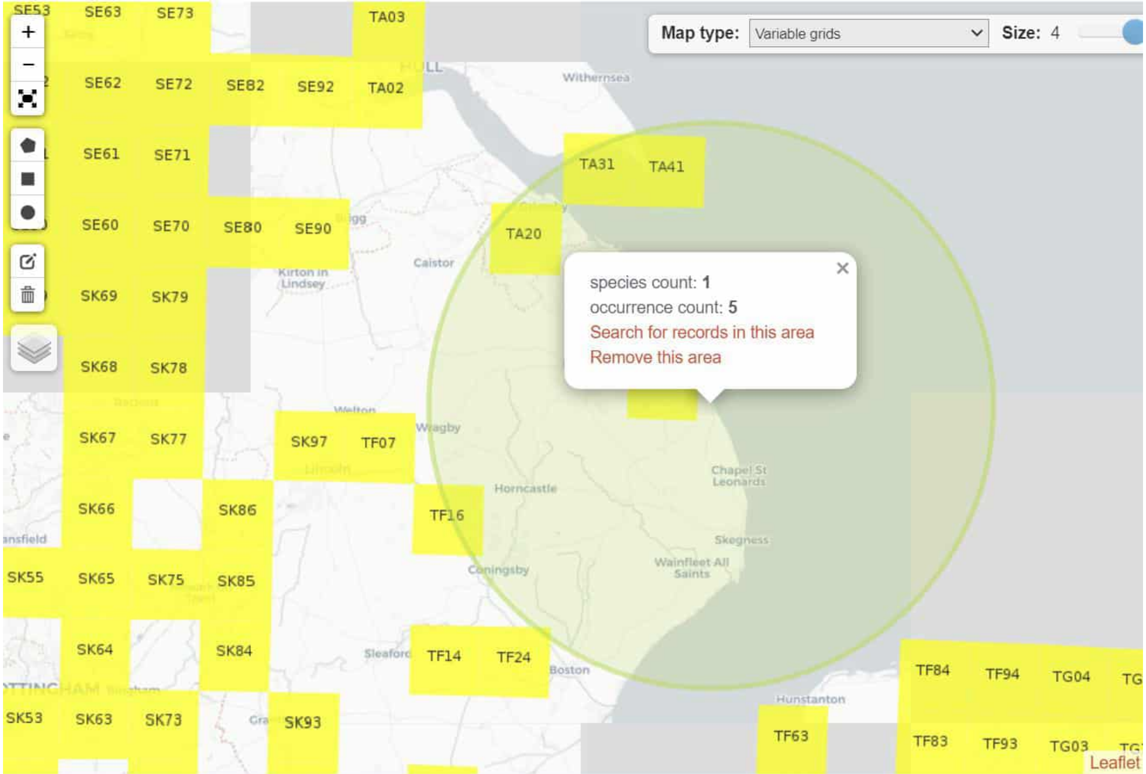
27.4.31 The Eurasian otter (*Lutra lutra*) is a largely solitary semi-aquatic mammal, which occurs in a wide variety of aquatic habitats such as rivers, streams, lakes, estuaries and on the coast. Coastal dwelling populations use shallow, inshore marine areas for feeding but they also require access to fresh water for bathing and terrestrial areas for resting and breeding. Their foraging range in the marine environment is limited to coastal areas (JNCC 2022b).

27.4.32 An otter’s foraging range is highly dependent on the quality of its habitat and food. There is evidence that some male otters will travel as far as 80 km but it is more usual for them to range between 10 and 40 km along the coastline (Gov.uk, 2022). Coastal otters can hunt as far as 100 m offshore in water up to 10 m deep, but most feeding is done much closer to shore in water that is less than 3 m deep (The Otter Consultancy, 2009).

27.4.33 Sightings for the Eurasian otter peak in May to June, and September to October, although they can be seen all year round (NBN Atlas, 2023).

27.4.34 Although the Eurasian otter is found along the UK coastline there have only been rare recent sightings recorded within the Study Area. Figure 27-4 illustrates a 40 km buffer from the proposed Landfall sites and the number of sightings between 2012 and 2022.

Figure 27-4: Eurasian otter sightings between 2012 and 2022 at the proposed Landfall sites. Source NBN Atlas (2023)



Protected Species

27.4.35 Table 27-5 lists the protection afforded to species which have been identified within the Study Area. This list includes historical and recent sightings. 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 North-East Atlantic – OSPAR Convention. The OSPAR Convention aims to protect the marine environment of the North-East 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 Conservation of Habitats and Species Regulations 2017 (as amended) (COHSR)
- 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).

Table 27-5: Protected species

Species	International			UK		England
	OSPAR	CITES	IUCN	Wildlife and Countryside Act	COMHSR	Species of Principal Importance[7]
Cetaceans						
Harbour porpoise	Yes	Appendix II	Least Concern	Schedule 5	Annex II & Annex IV	Y
Common dolphin		Appendix I	Least Concern	Schedule 5	Annex IV	Y
Bottlenose dolphin		Annex A	Least Concern	Schedule 5	Annex IV	Y
White-beaked dolphin		Appendix I	Least Concern	Schedule 5	Annex II & Annex IV	Y
Atlantic white-sided dolphin		Appendix I	Least Concern	Schedule 5	Annex IV	Y
Risso's Dolphin		Appendix I	Least Concern	Schedule 5	Annex IV	Y
Minke whale		Appendix I	Least Concern	Schedule 5	Annex IV	Y
Humpback whale		Appendix II	Least Concern	Schedule 5	Annex IV	
Long-finned pilot whale		Appendix II	Least Concern	Schedule 5	Annex IV	Y
Fin whale		Appendix I	Vulnerable	Schedule 5	Annex IV	Y
Northern bottlenose whale		Appendix I	Near threatened	Schedule 5	Annex IV	
Killer whale		Appendix I	Data deficient	Schedule 5	Annex IV	Y
Sperm whale		Appendix I	Vulnerable	Schedule 5	Annex IV	Y
Pinnipeds						
Grey seal			Least Concern		Annex II	
Harbour (Common) seal			Least Concern		Annex II	Y
Otters						
Eurasian otter		Appendix I	Near Threatened	Schedule 5	Annex II & Annex IV	
Chelonians						
Leatherback turtle	Yes		Vulnerable	Schedule 5	Annex IV	Y

[7] As listed in Section 41 of the NERC Act (NERC, 2006)

Designated Sites

27.4.36 The HRA Screening and MCZ Screening Assessment will identify the relevant designated sites to be considered by the HRA and EIA. For cetaceans the assessments will use management units as defined by JNCC (2023) to identify relevant sites. Any transboundary sites within 250 km of the Scoping boundary will also be considered. For pinnipeds, sites within 100 km of the Scoping boundary for grey seal and 50 km of the Scoping Boundary for harbour seal are considered relevant. The following lists the relevant designated sites identified.

Southern North Sea SAC

27.4.37 The Scoping Boundary for the Projects crosses through the Southern North Sea SAC for 41-47 km. The SAC is an area of importance for harbour porpoise. This European 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). It is estimated the site supports 17.5% of the UK North Sea MU population (JNCC, 2023). The population size for the Southern North Sea SAC was estimated to be between 11,864 and 28,889 in 2019 (JNCC, 2019a). Animals are thought to move latitudinally between preferred summer and winter grounds within the SAC. The Scoping Boundary for the Projects crosses both the harbour porpoises' summer and winter grounds for 41-47 km and 2-9 km respectively. The conservation objective for the site is to maintain the favourable conservation status of the species.

27.4.38 Figure 27-5 (Drawing C01494-EGL3&4-SPEC-013) illustrates both the summer and winter grounds for the harbour porpoise in the Southern North Sea SAC.

Humber Estuary SAC

27.4.39 The Scoping Boundary lies approximately 4.1 km from the Humber Estuary SAC. The site extends for 366.57 km^2 and includes the second largest coastal plain estuary in the UK. Grey seals are listed as a qualifying feature of this SAC. The range of salinity, substrate and exposure to wave action influences the estuarine habitats and the range of species that utilise them; these include a breeding bird assemblage, winter and passage waterfowl, river and sea lamprey, grey seal, vascular plants and invertebrates (Natural England, 2014). The main haul out site used throughout the year by grey seal on the Lincolnshire coast is Donna Nook (Humber Nature Partnership, 2023). In 2018 there was an estimated pup count of 2,066 with a total population counted of 6,288 (SCOS, 2022). However, in recent years the grey seal population has decreased by nearly 40% to 3,897 in 2021. The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

The Wash and North Norfolk Coast SAC

27.4.40 The Scoping Boundary lies approximately 16.3 km from The Wash and North Norfolk Coast SAC. 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. This site is the largest colony of harbour seal in the UK, supporting some 7% of the total UK population. The Study Area falls within the foraging range of Eurasian 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.

Berwickshire and Northumberland Coast SAC

27.4.41 The Scoping Boundary in relation to EGL 4 lies approximately 22.9 km from the Berwickshire and Northumberland Coast SAC. The SAC stretches from Fast Castle Head in Scotland to Alnmouth in England, encompassing both Lindisfarne and the Farne Islands. The site is 652.26 km^2 in size and supports a breeding colony of grey seal which supports around 2.5% of annual UK grey seal pup production (JNCC, 2023a). The conservation objective for the site is to maintain and/or restore the favourable conservation status of the species.

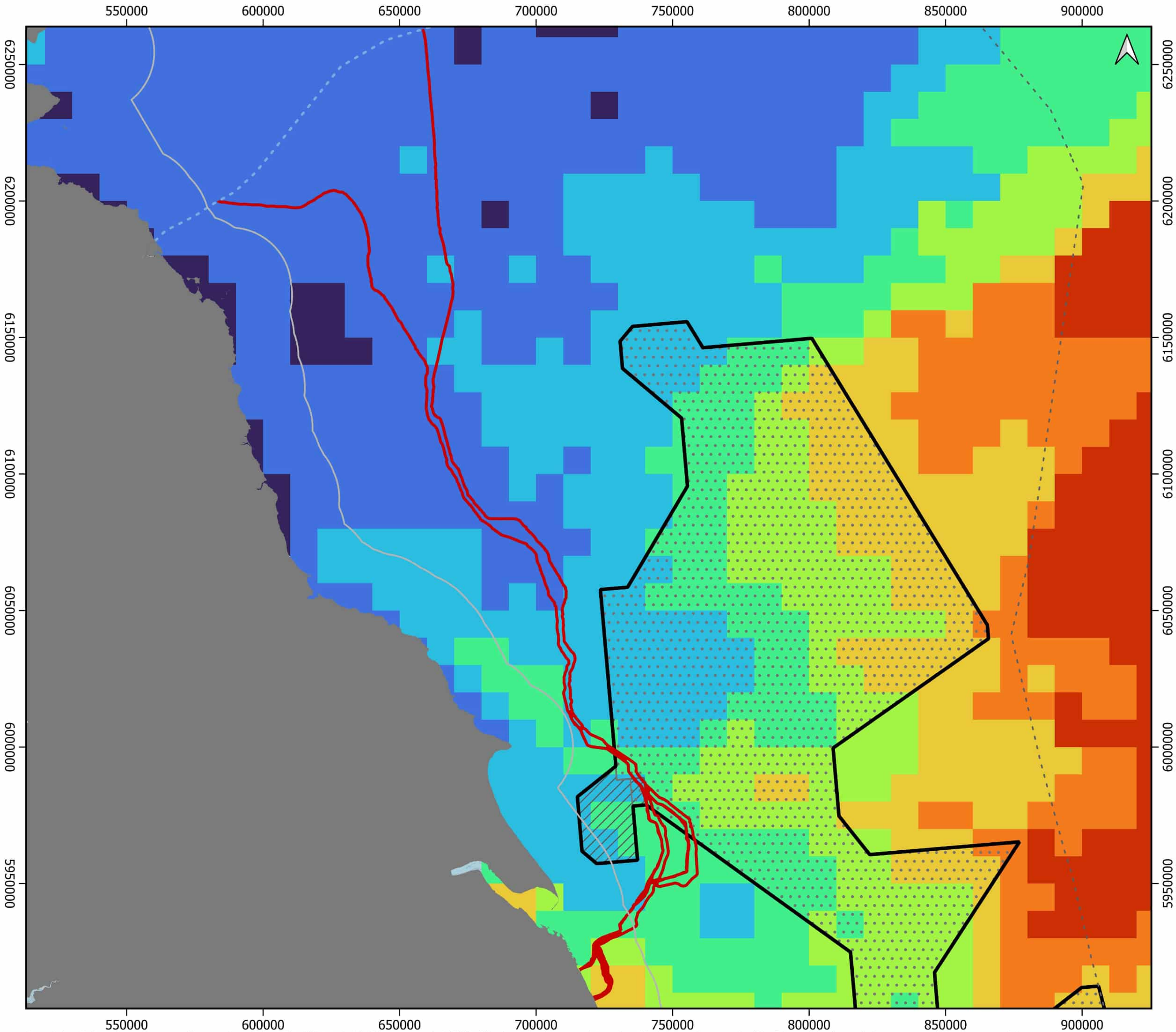
Teesmouth and Cleveland Coast SSSI and NNR

27.4.42 The Teesmouth NNR is underpinned by the Teesmouth and Cleveland Coast SSSI. The Scoping Boundary lies approximately 63.8 km from the Teesmouth NNR and 51.9 km from the Cleveland Coast SSSI. Harbour seals (*Phoca vitulina*) historically inhabited the mouth of the River Tees but were absent for much of the 20th century due to pollution. They recolonised the area in the 1980s, forming a regular breeding colony. 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.

Seal haul-out sites

27.4.43 The main breeding and haul out sites within the Study Area for grey seal are Donna Nook on the Lincolnshire coast, which is 7.7 km away from the Scoping Boundary, and the Farne Islands, Lindisfarne and Coquet Islands on the Northumberland coast.

27.4.44 The main harbour seal haul-out site is located in The Wash on the Lincolnshire/Norfolk coast. Harbour seals have also been observed hauling-out at Donna Nook in Lincolnshire. Figure 27-6 (Drawing: C01494-EGL3&4-SPEC-014) illustrates the seal haul out sites within proximity of the English Offshore Scheme Scoping Boundary.



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Harbour Porpoise Summer and Winter Ground within the Southern North Sea SAC

C01494-EGL3&4-SPEC-013-B

- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- Southern North Sea Special Area of Conservation (SAC)
- Summer Area (Southern North Sea SAC)
- Winter Area (Southern North Sea SAC)

Harbour Porpoise (Animals per km2)

- <= 0.1099
- 0.1099 - 0.2198
- 0.2198 - 0.3298
- 0.3298 - 0.4397
- 0.4397 - 0.5496
- 0.5496 - 0.6595
- 0.6595 - 0.7694
- 0.7694 - 0.8794
- 0.8794 - 0.9893
- > 0.9893

0 10 20 NM

0 25 50 KM

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Reviewed	S Pearce
Authorised	J Drew-Murphy

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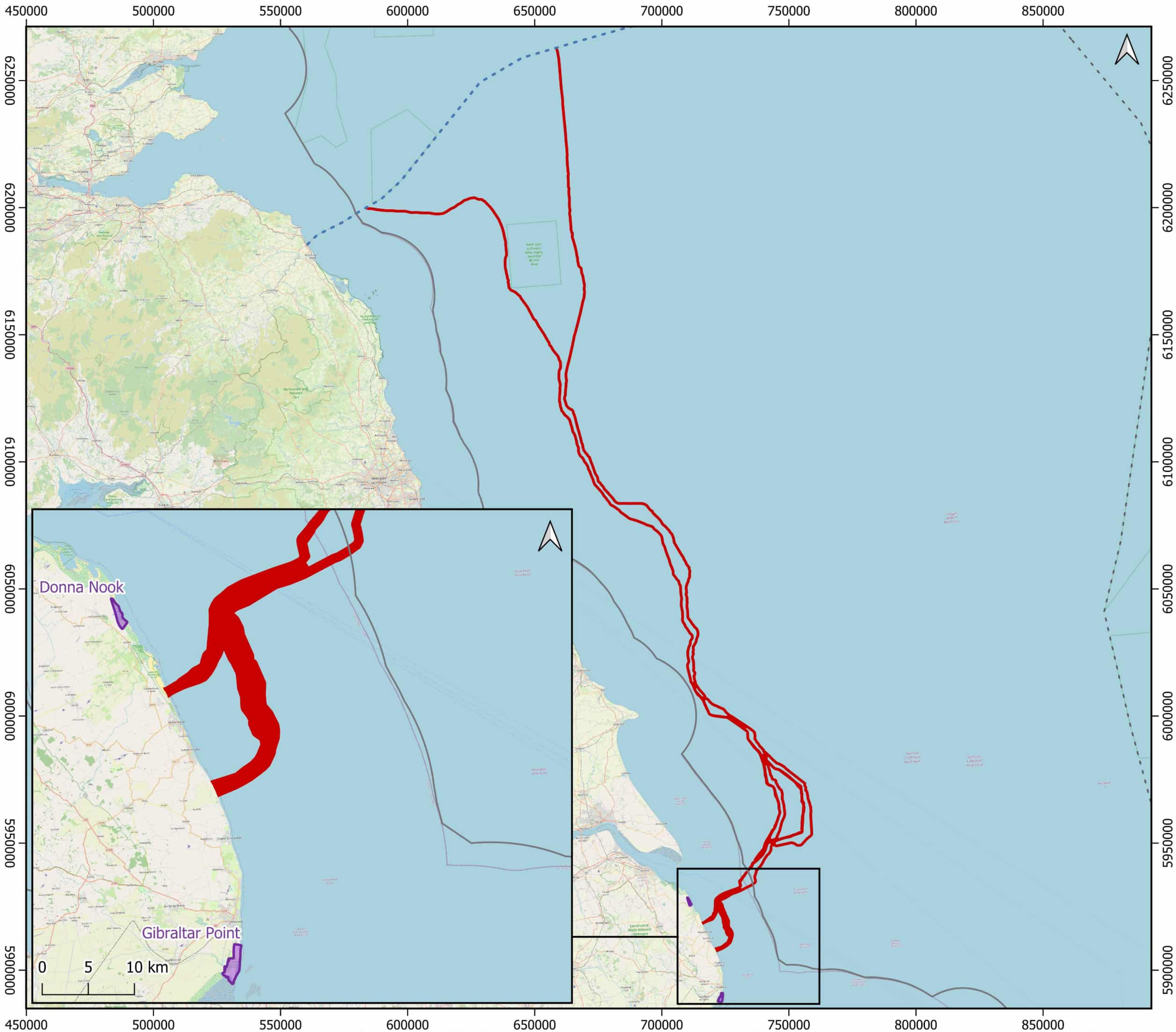

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Designated Seal Haul Out Sites within Proximity of the Scoping Boundary

C01494-EGL3&4-SPEC-014-C

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- Seal Haul Out

0 10 20 NM

0 25 50 KM

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Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,450,000
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Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 10/07/2024

27.5 Proposed Assessment Methodology

27.5.1 The marine mammal and marine reptile EIA will follow the approach set out in Part 3, Chapter 21 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach. The EIA chapter will be prepared in accordance with the following guidance:

- Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (NOAA, 2018)
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. (Southall *et al.,* 2019)
- Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al.,* 2014)
- Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland) (JNCC, 2020)

27.5.2 Results from other topic chapters, such as marine physical processes, fish and shellfish and intertidal and subtidal benthic ecology will be used to establish the potential impacts on supporting habitat and prey species for marine mammals and marine reptiles. Where impacts are not predicted to be significant, simple assessments using an evidence-based approach that is proportionate to the anticipated level of significance will be undertaken.

27.5.3 Underwater noise impacts from vessels and equipment and the potential for mortality, permanent and temporary injury and behavioural disturbance will be assessed using the latest peer-reviewed impact thresholds reported in Southall *et al.* (2019) and Popper *et al.* (2014), to provide a quantitative prediction of the number of animals at risk. This information will consider the best available scientific evidence on the movement and behaviour of marine mammals, both under baseline conditions and would calculate the probability of animals being exposed to sufficient noise levels to cause injury or behavioural disturbance.

27.5.4 The details of the assessment methodology will be refined as further information becomes available on the project description, the physical site conditions (bathymetry and substrate types) and the construction programme. An estimation of the numbers of animals at risk will be given for the Projects alone and in-combination with other projects in the area. The proposed methodology will be discussed and agreed with Cefas, JNCC, and NE.

27.5.5 Where significant effects are identified, mitigation measures will be proposed, and residual effects presented.

27.6 Scope of Assessment

27.6.1 A range of potential impacts on marine mammals and marine reptiles have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 27-6 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage, the impact has been scoped 'in' to the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped ‘out’ of the EIA.

Table 27-6: Scoping assessment of impacts on marine mammals and marine reptiles

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Temporary habitat loss / seabed disturbance	Pre-sweeping of sand waves Cable burial and trenching	Cetaceans and pinnipeds	**IN –** Pre-sweeping of sand waves to enable cable burial has the potential to cause a localised reduction in or degradation of the extent of supporting habitats for prey species of marine mammals, for example sandeels which require soft sediments for winter hibernation and overnight burial.		
Permanent habitat loss	Deposit of external cable protection	Cetaceans and pinnipeds	**IN –** The deposit of external cable protection has the potential to result in a localised reduction in the extent of supporting habitats. Activities associated with the installation, repair and decommissioning of external cable protection are likely to disturb the seabed and could lead to the degradation of the favourable condition of supporting habitats and processes.		
Underwater noise changes	Presence of project vessels and equipment (including cable trenching)	Cetaceans and pinnipeds	**IN -** The presence of Projects' vessels and equipment used to install the cables will generate underwater noise. The Oslo and Paris (OSPAR) Convention (2012) considered that sound associated with the construction, removal or operation of submarine cables is less harmful compared to impulsive sound activities such as seismic surveys, military activities or construction work involving pile driving (OSPAR Convention 2012). Animals would need to remain in close proximity (<100 m) to the source continuously for 24 hours to be exposed to levels sufficient to cause auditory injury (Barham and Mason 2019, Orsted 2019). It should be noted that geophysical surveys are exempt from requiring a Marine Licence under the MCAA, provided they meet certain conditions. The EIA will not consider the effects of the pre- and post-installation surveys. Instead, survey contractors will be required to provide Screening for AA and a European Protected Species Assessment to ensure they meet the required conditions for an exempt activity. Entries into the UK Marine Noise Registry will be made as appropriate.	**IN -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. In these circumstances, the significance of the effect will be of lower magnitude than during installation.	**IN -** The significance of the effect during decommissioning is predicted to be of similar or lower magnitude than installation.
Changes in prey availability	Pre-sweeping of sand waves Cable burial and trenching Deposit of external cable protection	Cetaceans and pinnipeds	**IN –** Changes in prey availability is a potential indirect impact which could arise during any phase of the project life cycle if the Projects have a significant effect on fish species such as sandeel and Atlantic herring which are important prey species. Disturbance of the seabed during the spawning season for species with a demersal life stage could have a direct impact on the spawning biomass for a specific year group, leading to a shortage of prey species. The impact pathway has been scoped IN under the fish and shellfish topic with respect to sandeel and Atlantic herring habitat. Relevant studies need to be undertaken to rule out any significant indirect effects on marine mammals therefore the impact has been scoped IN to the EIA.		
Collision with project vessels	Presence of project vessels and equipment	Cetaceans and pinnipeds	**OUT –**There are known incidents of marine mammals colliding with fast moving vessels. However, it is largely recognised that the key factors contributing to collision between marine mammals and vessels are the presence of both in the same area and vessel speed (see Schoeman *et al.* (2023) for review). Injuries to marine mammals from vessel strikes are species-dependent but generally are more severe at higher impact speeds (Wang *et al.,* 2007).		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
			Laist *et al*. (2001) conclude that fatal collisions with marine mammals occur at vessel speeds of 14 knots or more. Vessels involved in the Projects are likely to be either stationary or travelling slowly (circa 5 knots) during construction, maintenance or decommissioning activities, thus allowing both the vessel and any animal in the area time to avoid collision. During transit times, Projects' vessels will be travelling at speeds greater than 5 knots. However, Projects' vessels will follow the shipping routes within the Study Area. Cetaceans and pinnipeds in the area are exposed to vessels of all sizes on a regular basis due to the density of shipping in the North Sea. Therefore, the collision risk posed by project vessels associated with the Projects is likely to be significantly lower than that posed by commercial shipping activity. No significant effects are predicted. This impact pathway has therefore been scoped out of the EIA.		
Electromagnetic changes / Barrier to species movement	Presence of cables	Cetaceans and pinnipeds	N/A	**OUT –** No evidence of magnetic sensitivity has been reported for pinnipeds (BOEMRE 2011). 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). Calculations of EMF fields for similar specification HVDC cables to the Project show rapid attenuation of the magnetic fields to background levels within 10 m - 50 m of the cables (National Grid and Energinet 2017, BOEMRE 2011). This localised change in the magnetic field may temporarily affect sensitive species as they cross the cables or pass alongside their length and may temporarily reduce their navigational ability within the zone of effect. However, Gill (2005) reports that there have been no impacts to the migration of cetaceans over existing interconnector cables and Walker (2001) note harbour porpoise migration across the Basslink has been observed unhindered despite several crossings of operating sub-sea HVDC cables. Given the rapid attenuation of the magnetic field, the lack of evidence of effects on cetaceans, and the predominantly pelagic existence resulting in separation with the change in field, cetaceans have a relatively low likelihood of being affected by EMF. The impact pathway has been scoped out of the EIA.	N/A
Temperature increase	Presence of cables	Cetaceans and pinnipeds	N/A	**OUT –** During the operation of an HVDC cable heat losses occur because of the resistance in the cable/conductor. This can	N/A

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
				cause localised heating of the surrounding environment (i.e., sediment for buried cables, or water in the interstitial spaces of external cable protection). There are no specific regulatory limits applied to temperature changes in the seabed, although a 2 °C change between seabed surface and 0.2 m depth is used as a guideline in Germany. Conservative calculations undertaken for Viking Link (which crosses German waters) concluded that heating in excess of 2 °C at 20 cm sediment depth will only occur if cables are bundled and buried to less than 0.75 m (National Grid and Energinet 2017). Any temperature changes will be localised to the immediate environment surrounding the cable and undetectable against natural temperature fluctuations in the surrounding sediments and water column. No significant effects are predicted. This impact pathway has therefore been scoped out of the EIA.	
Accidental Spills *(Hydrocarbon & PAH contamination)*	Presence of project vessels and equipment	Cetaceans and pinnipeds	**OUT –** Projects' vessels and contractors will 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. Compliance with Regulations will be sufficient to minimise the risk to the environment.		
Visual disturbance	Presence of project vessels and equipment	Cetaceans and pinnipeds	**OUT –** The physical presence of the Projects' vessels and equipment during all phases of the Projects have the potential to disturb marine mammals. Pinnipeds are more sensitive to anthropogenic disturbance when hauled out. Wilson (2013) 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 harbour and grey seals (i.e., one at which there is a low risk of significant numbers of seals flushing) is about 200 m. There are no seal haul-out sites within 1 km of the Projects. The nearest haul out site is Donna Nook which is 7.7 km away from the Scoping Boundary. 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 will be temporary and transient, restricted to discreet activities and periods and will not increase the shipping baseline other than briefly. Vessels will be moving slowly (circa 5 knots) whilst within the Scoping Boundary. Therefore, no significant disturbance effects are predicted from the presence of Projects' vessels and the impact pathway has been scoped out of the EIA.		

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28 Shipping and Navigation

nationalgrid

28. Shipping and Navigation

28.1 Study Area Definition

28.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation (including maintenance and repair) and decommissioning of the Projects on shipping activity and key navigation features.

28.1.2 The Study Area assessed for shipping and navigation includes the Scoping Boundary plus an additional 5 NM either side to ensure that all relevant shipping patterns and navigational features are captured. This Study Area is considered sufficient to characterise the Shipping and Navigation baseline while also remaining project-specific in the vessel activity and navigational features that it captures.

28.2 Data Sources

28.2.1 Data sources for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are detailed in Table 28-1 and described in the following sub-sections.

Table 28-1: Key publicly available data sources for shipping and navigation

Data Source	Description
MariTrace Automatic Identification System (AIS) Vessel Data	5-minute time series data of shipping activities from 01/03/2022 to 28/02/2023 (12 months of data). Purchased from MariTrace.
Royal Yachting Association (RYA) UK Coastal Atlas of Recreational Boating 2.1	AIS dataset of recreational vessels. Purchased from RYA.
European Marine Observation and Data Network (EMODnet) vessel density maps of European waters	Coarse-grained vessel density maps. Publicly available at https://www.emodnet-humanactivities.eu/view-data.php
MMO Fishing Data Marine Traffic	UK sea fisheries annual statistics from 2022. Publicly available at https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2022
Royal National Lifeboat Institution (RNLI) Incidents Data	RNLI 2008-2023 datasets including Returns of Service, lifeboat stations, and support centres. Publicly available at https://data-rnli.opendata.arcgis.com/.
Marine Accident Investigation Branch (MAIB) annual reports	MAIB incident reports, covering a ten-year period from 2013 to 2023. Publicly available at https://www.gov.uk/maib-reports

Data Source	Description
Marine Themes Vector Data	Marine Themes Vector data tiles including anchorage areas, marine use areas, aquaculture, navigational lines, navigational routes, beacons and buoys. Purchased from FIND Mapping.
Admiralty Charts	Admiralty charts via a Web Mapping Service (WMS) feed. Purchased from MarineFind.

Site-Specific Survey Data

28.2.2 NGET holds AIS data purchased from MariTrace for the English Offshore Scheme (1 March 2022 – 28 February 2023, 12 months of data). This data has been used to inform this EIA Scoping Report. A further 12 months of data will be purchased to inform the PEIR. This 5-minute time series data, supplemented by publicly available EMODnet data, will be used to create vessel density maps. The AIS data extends outside the 5 NM Study Area to cover previously identified potential English Offshore Scheme routes and provide a characterisation of general vessel behaviour in the area.

28.2.3 Furthermore, the Projects' FLO will be consulted to validate desk-based fishing data and identify any fishing hotspots which need to be captured in the Projects' Navigational Risk Assessment (NRA). Where relevant, commercial fishing vessel activity will be assessed using Vessel Monitoring System (VMS) data in the Commercial Fisheries chapter.

Publicly Available Data

28.2.4 The European Marine Observation and Data Network (EMODnet) vessel density maps are created from AIS data, which is an automatic tracking system used to identify and locate vessels by electronically exchanging data with other nearby ships, AIS coastal stations and satellites. They provide the total ship presence time for ship categories for every month (vessel hours per month) on a 1 km grid that follows the European Economic Area (EEA)/Inspire standards. The International Maritime Organisation (IMO) requires AIS transponders to be fitted aboard international voyaging ships with gross tonnage of 300 or more tonnes, and all passenger ships regardless of size (IMO, 2015). This would cover almost all commercial vessels and most private vessels; however, some smaller fishing and recreational vessels could be missing from the AIS dataset.

28.2.5 AIS data from recreational vessels sourced from the RYA will be used to determine the density per unit area of boating in UK coastal waters, to give a picture of the most utilised routes and areas by leisure boaters.

28.2.6 Publicly available vessel data will be cross-referenced with the live traffic maps on the Marine Traffic website (not available to purchase/download) to ensure that shipping patterns, usage of anchorages and usage of ports remain unchanged. Furthermore, the vessel density for purchased data is in a finer resolution (0.08 km grid) than the publicly available data, therefore, smaller shipping patterns in vessels can be identified.

Additional Studies

Navigational Risk Assessment (NRA)

28.2.7 An NRA will be carried out. This will include a baseline study which will summarise the available background navigation data and focus on any key shipping routes and/or anchorage areas and fishing activity in the vicinity of the Projects. The primary input to the NRA will be 12 months of AIS data, considering seasonal variations. Additional data and information sources beyond those used in this Scoping Report include:

- MAIB and RNLI maritime incident data in the area (10 years);
- Additional fishing vessel activity data (e.g., VMS satellite data); and
- Port statistics.

28.2.8 The NRA will be carried out using a Formal Safety Assessment (FSA) compliant with IMO Revised Guidelines for FSA for Use in the IMO Rule-Making Process (IMO, 2018). The assessment approach is described in Section 28.5.

28.2.9 The NRA will draw upon project specific data such as the CBRA to be completed for the Projects which will define the depth of burial for the cables and the location and quantity of external cable protection required. The EIA for shipping and navigation would be based on the conclusions of the NRA.

28.2.10 In addition, it is the intention of NGET to hold a Marine Hazard Identification workshop with the MCA and other key stakeholders to ensure that all Projects' phases are managed to a point where risk relating to shipping & navigation is reduced and considered to be ALARP.

Commercial Fishing Activity

28.2.11 A study to assess commercial fishing activity was undertaken by Brown and May Marine Ltd. in March 2023 to understand the spatial and temporal distribution of fishing activity within the Study Area. Alongside this, and to inform the EIA and NRA, interviews with local and regional fisheries stakeholders have been conducted to obtain additional information on fishery statistics such as fishing vessels operating in the area, types and sizes of vessels, fishing gear(s) used, fishing effort, target species, seasonality in effort or species abundance, and location of key grounds. These interviews will be supplemented by a desk-based review of catch and effort statistics. AIS data from UK and European fishing vessels over 15 m in length and VMS data from UK registered commercial fishing vessels over 12 m in length will also be obtained and interrogated to assess the distribution of fishing effort. It should be noted that vessels under 12 m are not presently captured within this data, the majority of these vessels tend to be inshore creel/potting vessels which is recognised as important fisheries within the Study Area. Aerial surveillance data gathered by the MMO will also be used to augment a qualitative assessment of the smaller fishing boats operating in the area. Information will also be sought from the relevant IFCAs including Eastern, North-Eastern and Northumberland. This information would be used to inform the NRA and subsequent EIA.

CBRA and Employer's Burial Assessment Study

28.2.12 A CBRA will be undertaken, informed by survey data, to determine the recommended burial depth for the cables taking into consideration seabed conditions and external risks such as fisheries use of the area and potential for anchor strike from vessels.

The CBRA approach includes a probabilistic assessment given the geological seabed properties and risk of external aggressors interacting with the cable, including anchor penetration studies. The Employer's Burial Assessment Study then considers the outcomes of the CBRA and looks at the different installation tools that could be used, to determine if the recommended burial depth (as concluded by the CBRA) is feasible or whether external cable protection will be required.

Compass Deviation

28.2.13 There is the potential for the magnetic fields produced by the operational cables to produce a small, localised electric field with the passage of sea water, the strength of which varies with distance from the cables and the strength, speed and direction of the tide. If large enough, the magnetic fields (in combination with earth's magnetic field) have the potential to affect ships' compass readings (Renew, 2023). The MCA recommend that the compass deviation should not exceed 3 degrees for 95% of a cable route, and for the remaining 5% of the cable route should be no more than 5 degrees. A study will be undertaken to determine the likely compass deviation based on the cable design. This will be presented with the PEIR and ES.

28.3 Consultation

28.3.1 The scope of the shipping and navigation chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 28-2 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 28-2: Summary of responses received during previous consultation

Organisation	Summary of response received	Response
MMO	Consideration to changes in vessel routeing needs to be given, particularly in heavy weather, due to the large number of other marine users in the region.	This will be assessed within the NRA, please see Section 28.5
	The MMO welcome the completion of an NRA and suggested a marine hazard identification workshop be held with the Maritime and Coastguard Agency (MCA).	Please see Section 28.2.3.1.
	A Burial Protection Index study should be completed, and subject to traffic volumes, an anchor penetration study may be necessary. The MMO acknowledge the intention to complete a CBRA, which will inform further assessments.	Please see Section 28.2.3.3.
MMO and MCA	The MMO and the MCA would expect the assessment to detail potential impact of navigational issues for commercial, fishing and recreational craft.	Please see Section 28.5 for list of issues to consider in the EIA.
	There is a potential for reduction to under keel clearance (UKC) which should be scoped into the assessment.	This will be assessed within

Organisation	Summary of response received	Response
		the NRA, please see Section 28.5
	If cable protection measures are required, a 5% reduction in surrounding depths referenced to Chart Datum will be considered, noting this is subject to further consultation at Marine License Application stage. Where this is not achievable, further discussions must be held.	This will be assessed within the NRA, please see Section 28.5
	An electromagnetic deviation study should be completed. On receipt of the report, the MMO has the right to request a deviation study of the cable route post installation.	Please see Section 28.2.3.4.

28.3.2 The Projects have already undertaken stakeholder consultation on the English Offshore Scheme to inform route development and option appraisal. However, consultation is an ongoing process and further consultation to inform the PIER and ES will be undertaken with the relevant stakeholders to supplement the desktop review and studies. Consultations will be used to agree the planned approach for the NRA (including a marine hazard identification workshop), verify the desk-based data sources and fill in any information gaps. The following, non-exhaustive list of bodies will be consulted to ensure that the most up-to-date information is collated:

- MCA
- Chamber of Shipping
- Trinity House
- RYA
- Local sailing clubs
- NFFO
- IFCAs - Eastern, North-Eastern and Northumberland
- ABP Humber Port
- Port of Tyne
- Port of Sunderland
- Seaham Harbour
- Tees and Hartlepool Port Authority
- Port of Blyth
- Triton Knoll OWF
- Lincs OWF
- North Sea Transition Authority (NSTA)

28.3.3 Outputs from stakeholder engagement will be incorporated into the development of the NRA, any potential hazards and concerns raised will be addressed in the NRA and mitigation measures will be discussed and established where appropriate.

28.4 Baseline Characterisation

28.4.1 AIS data has been used to determine the size and quantity of vessels which operate in the vicinity of the Scoping Boundary. AIS provides information on the type of vessel (see Table 28-3 below). It should be noted that in England vessels under 12m are not required to carry AIS equipment.

28.4.2 The number of AIS vessel data points within the dataset totals 750. Table 28-3 displays the distribution of vessels of each vessel type, categorised by vessel type; the output of all vessels is illustrated in Figure 28-1 and Figure 28-3.

Table 28-3: Number of AIS data points by each vessel type

Vessel Type	% Vessels of Total AIS Data in English Waters
Cargo	49.6%
Dredging or Underwater Operations	1.2%
Fishing	5.6%
High-Speed Craft	1.3%
Military And Law Enforcement	1.1%
Other	5.3%
Passenger	0.5%
Pleasure Craft	1.9%
Sailing	5.3%
Service	1.2%
Tanker	24.3%
Tug or Towing	1.7%
Unknown	0.9%
Total Number of AIS Data Points	*750*

Figure 28-1: AIS Vessel Density (Drawing: C01494-EGL3&4-SHIP-001)

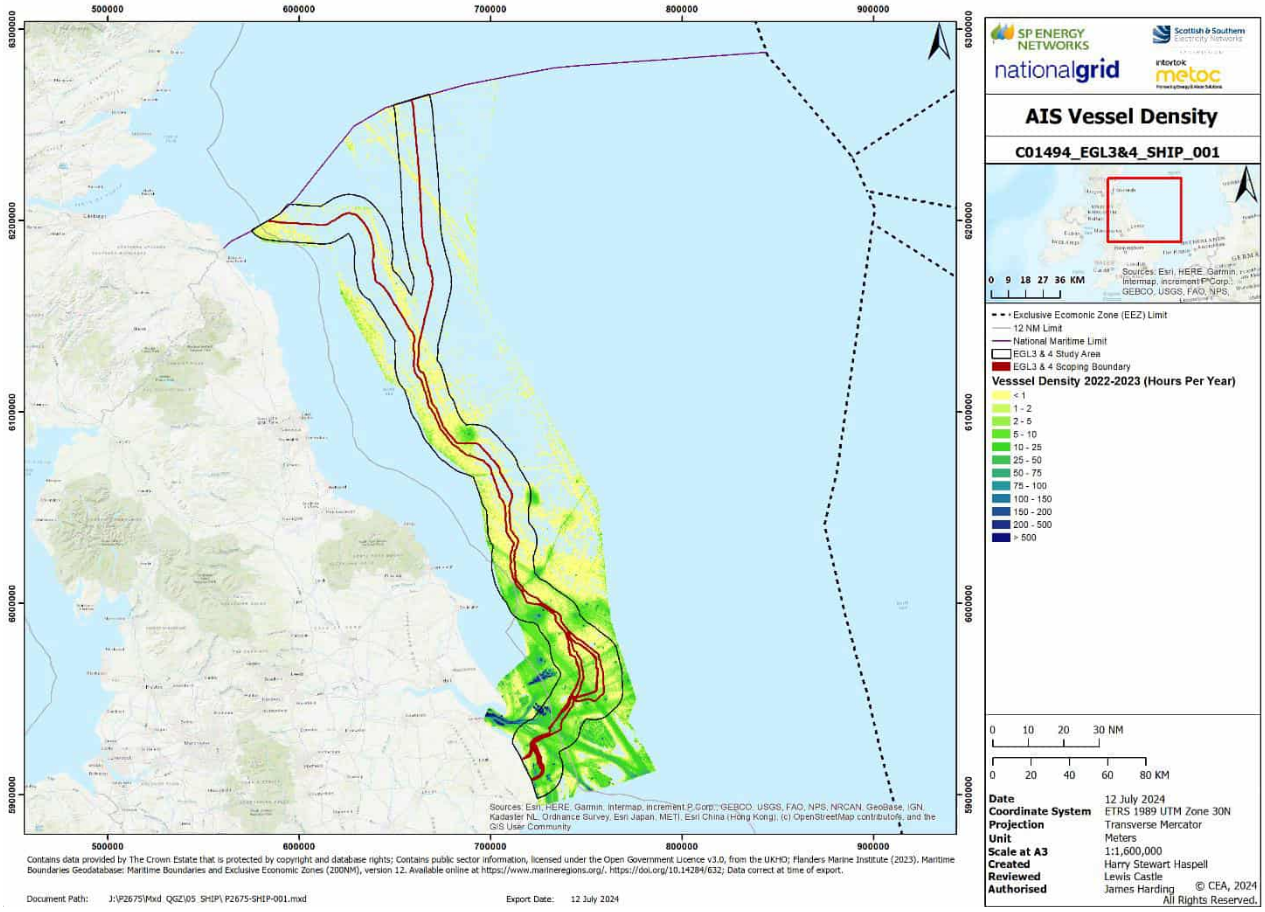
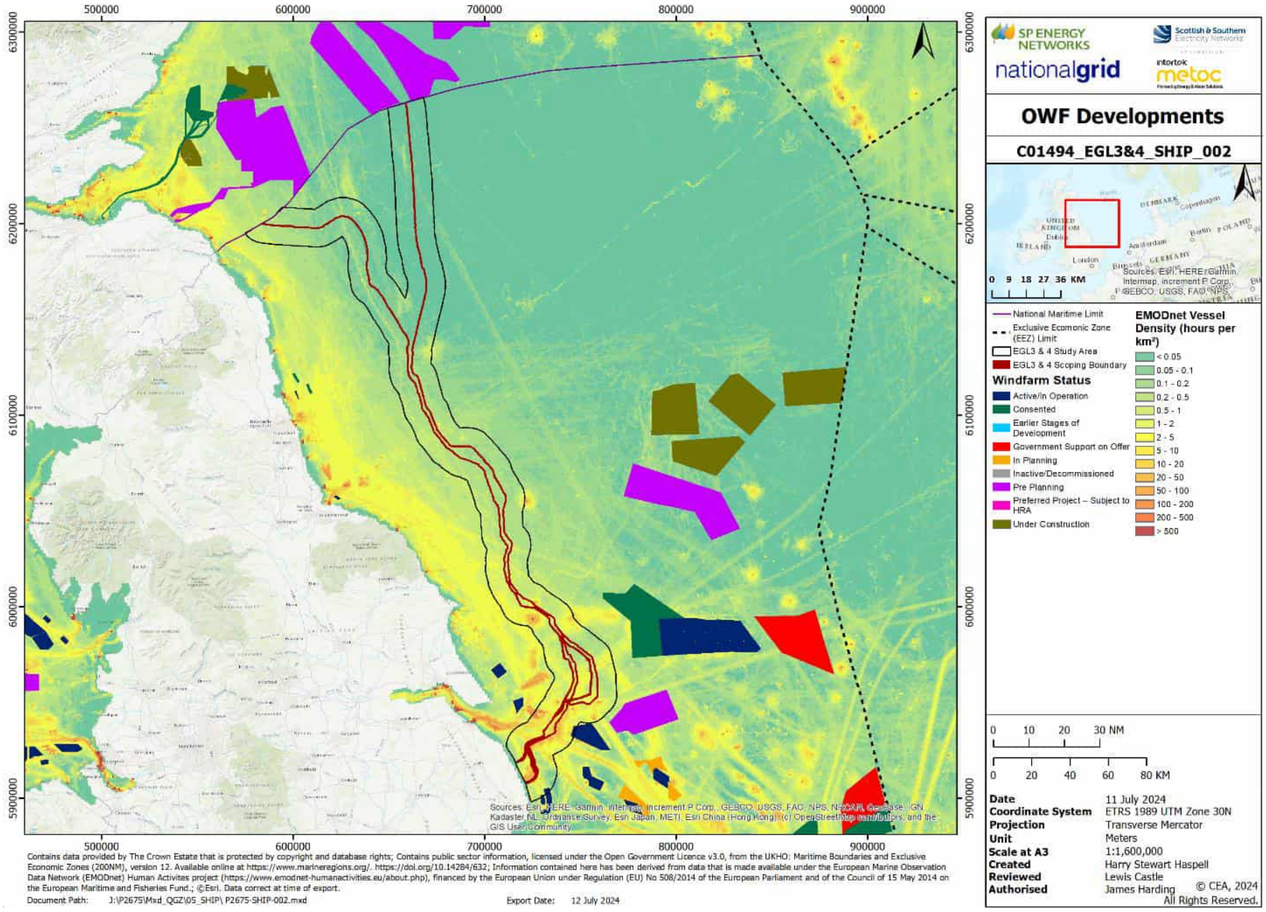


Figure 28-2: AIS Vessel Density with wind farm locations (Drawing: C01494-EGL3&4-SHIP-002)



28.4.3 The key navigational features found in the Study Area are:

- Humber Vessel Traffic Services
- Sand Hole deep water anchorage
- OWFs (Triton Knoll, Lincs, Inner Dowsing, Humber Gateway)
- Donna Nook Military Area
- Military Practice Area - Areas of Intense Aerial Activity (AIAA), Staxton, Druridge Bay

28.4.4 There are three main shipping lanes or areas within the Study Area identified by AIS data as shown in Figure 28-1 (Drawing:C01494-EGL3&4-SHIP-001). Most vessel traffic exists around the English Landfall area between 3_KP 0 to 3_KP 76 / 4_KP 0 to 4_KP 70 (as well as H3_KP6 to H3_KP13 / H4_KP 9 to H4_KP 16) with numerous shipping lanes leave the Port of Hull harbour (Humber Estuary). To a lesser extent between 3_KP 77 to 3_KP 171 / 4_KP 71 to 4_KP 165 (and at H3_KP 18 / H4_KP 17), there are shipping lanes out of Bridlington, Scarborough and Whitby, which mostly comprise of fishing vessels. Between approximately KP_3 215 to 3_KP 221 / 4_KP 207 to KP_4 213, a shipping lane is visible leaving Middlesbrough orientated in a North East – South West direction; the Projects cross perpendicular to this lane.

28.4.5 High vessel activity (over 500 vessel hours per year in certain locations) is found within and in close vicinity to the Humber estuary. High numbers of vessels travelling to/from the Associated British Ports (ABP) Humber ports transect the Scoping Boundary offshore of Lincolnshire in multiple locations at 3_KP 13 / 4_KP 11, 3_KP 28

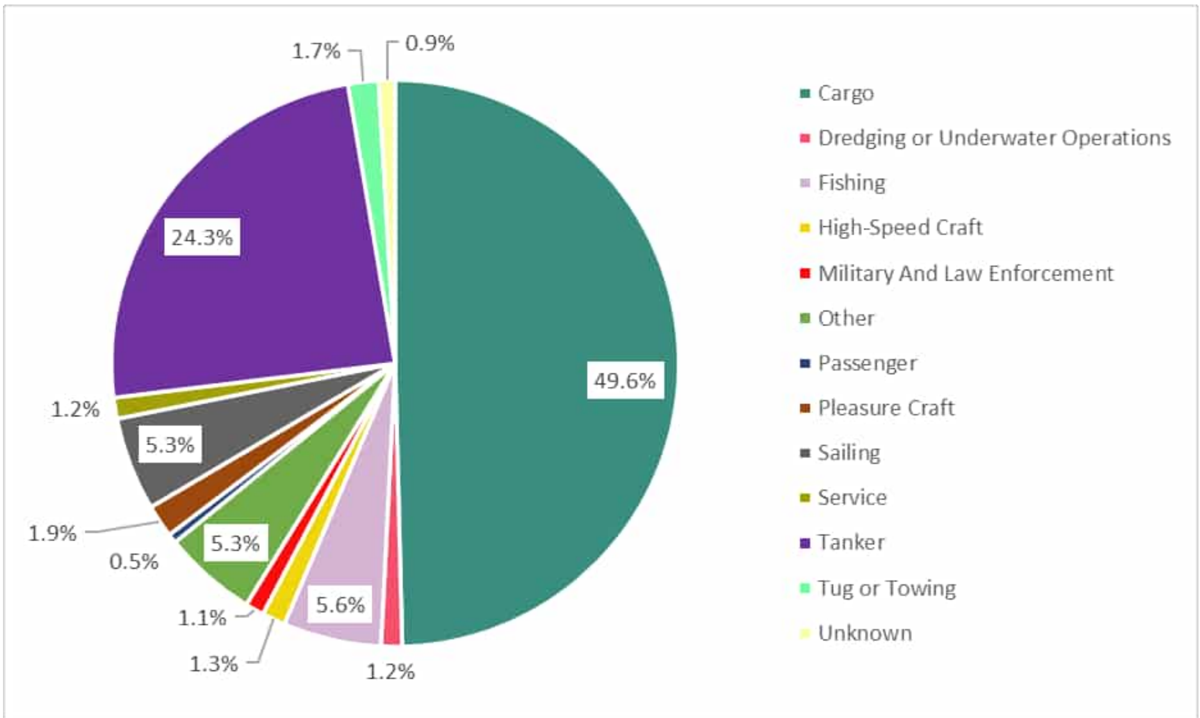
/ 4_KP 27 and 3_KP 39 / 4_KP 37. Another shipping channel heading northwest transects the Scoping Boundary at 3_KP 50 / 4_KP 48.

28.4.6 Vessels to the north of East Anglia can be shown to traverse around the existing OWF developments (e.g., Triton Knoll, Hornsea Projects, Race Bank) and those under development (e.g. Outer Dowsing), seen in Figure 28-2 (Drawing C01494-EGL3&4-SHIP-002).

28.4.7 There is a deep-water anchorage at Sand Hole approximately 9 km to the West of EGL 3 (3_KP 43 to 3_KP 49) and 15 km West of EGL 4 (4_KP 40 to 4_KP 48), partly inside the Study Area. This anchorage is 2.5 km to the East of the Humber Gateway OWF, which is fully commissioned.

28.4.8 As shown in Figure 28-3, cargo vessels comprise the highest proportion of vessel types identified within the Study Area, with 372 cargo vessels (49.6% of the total vessels). Cargo vessels are seen within the AIS dataset traversing over the Scoping Bounding in the shipping lanes between the Humber Estuary, East Anglia and the North, with the greatest intensity of cargo vessels between KP 30-42. Tankers (24.3% of the total vessels) follow a similar pattern to the cargo vessels.

Figure 28-3: Pie chart showing distribution of different vessel types in English Waters

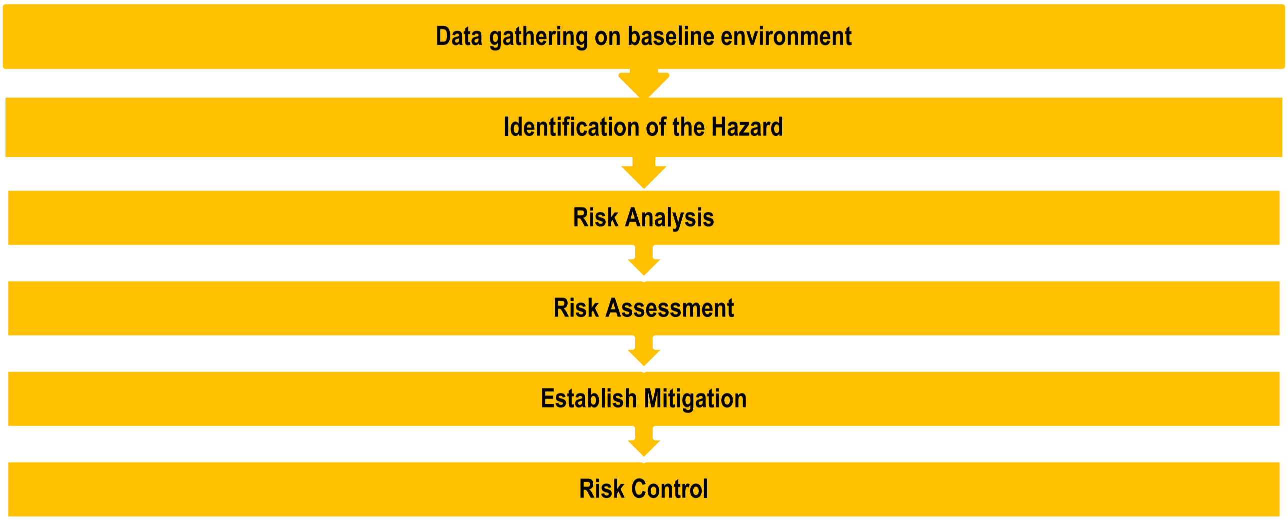


28.5 Proposed Assessment Methodology

Methodology Overview

28.5.1 The assessment process involves the following main steps presented in Figure 28-4. The NRA will be undertaken based on IMO standards (IMO, 2018) and using Marine Guidance Notes (MGNs; MGN, 2021). In carrying out these assessments, as far as reasonably possible, all three phases of the Projects life will be addressed, i.e., construction, operation and maintenance, and decommissioning. The methodology for accomplishing each step is described below.

Figure 28-4: Assessment steps



28.5.2 The EIA will detail the possible impact on navigational issues for commercial, fishing and recreational craft, specifically taking into consideration:

- Collision risk;
- Navigational safety;
- Risk management and emergency response;
- Marking and lighting of site and information to mariners;
- Effect on small craft navigational and communication equipment;
- The risk to drifting recreational craft in adverse weather or tidal conditions; and
- The intensification of vessel density due to funnelling between future developments.

28.5.3 The definition of "hazard" and "risk" for the NRA are:

- **Hazard** - A potential source of marine incidences and collisions to the existing baseline of other marine users; and
- **Risk** - The probability of suffering harm, loss or displacement and is a measure of the probability (frequency) and consequence of a hazard.

28.5.4 Below, Table 28-4 illustrates a high-level summary of each step of the NRA. Further information on the steps is detailed below in Sections 28.5.2. to 28.5.7.

Table 28-4: Overview of NRA methodology

Data Requirement	Method	Data Sources
Baseline Assessment	Establish current shipping conditions and features that exist within the study area. A specialist study to provide data on maritime activity, shipping intensity and density in the study area and a risk assessment of potential shipping	EMODnet vessel density maps of European waters AIS datasets (01/03/2022 – 28/02/2023) Admiralty charts RYA UK Coastal Atlas of Recreational Boating

Data Requirement	Method	Data Sources
	hazards such as collision risk and anchoring risks. A 5 NM buffer will be applied around the DCO application area to ensure that all shipping patterns and navigational features are captured.	MMO Fishing Data Marine Traffic RNLI Incidents Data MAIB annual reports Port Authority Information as required Sailing and Pilot books Project-specific reports and studies (e.g., AIS data, Fishing Activity Report, EMF study) IFCA - Eastern, North-Eastern and Northumberland.
Consultation	Proactive consultation with key ports authorities (e.g., ABP Humber) and the MCA, alongside other maritime stakeholders (e.g. local sailing clubs, RYA, Trinity House, Chamber of Shipping).	Stakeholder consultation meetings.
Hazard Identification	Identify known hazards expected to be encountered as a result of the offshore operations and presence of project vessels.	Data gathered from the baseline assessment. Potential hazards raised by stakeholders during consultation.
Risk Analysis	Determine the impact of hazards on navigational safety, displacement of vessels, and human safety in terms of frequency and consequence, developed using IMO guidelines.	Hazard identification phase IMO Guidelines (IMO, 2018).
Risk Assessment	Risks are examined using a risk matrix, which illustrates the combination of the frequency and the consequence of the hazard to establish the potential impact.	Frequency & consequences from the risk analysis phase.
Mitigation	Mitigation measures for each hazard is established to (in preferential order): prevent/avoid, reduce, or offset the potential risk. Gaps in existing procedures and areas in which mitigation may need to be enhanced will also be considered. Care to be taken to ensure that any new hazards created as a result are themselves identified and managed.	International Regulations for Preventing Collisions at Sea (COLREGs) IMO Guidelines UK Standards European Subsea Cable Association Guidance

Data Requirement	Method	Data Sources
Risk Control	Reduce risks on the existing shipping baseline to ALARP using mitigation measures. Additional analysis, consultation and enhanced mitigation measures are normally needed for risks that are assessed as Major after reducing risks to ALARP. Where further mitigation is not possible a residual hazard may remain.	Stakeholder consultation if required

Baseline Assessment

28.5.5 To assess the potential effects resulting from the Projects it is necessary to establish the current shipping conditions and features that exist along and near the Projects. A 5 NM buffer has been applied around the Scoping Boundary to ensure that all shipping patterns and navigational features are captured in the Shipping & Navigation Study Area.

28.5.6 The analysis would include:

- Potential accidents resulting from navigation activities (MAIB & RLNI);
- Navigation activities affected by the Projects;
- Project structures that could affect navigation activities;
- Project phases that could affect navigation activities;
- Other structures and features that could affect navigation activities;
- Vessel types involved in navigation activities;
- Conditions affecting navigation activities; and
- Human actions related to navigation activities for use in hazard identification (if possible).

Hazard Identification

28.5.7 The hazard identification phase seeks to build on the work of the data gathering and identify known hazards expected to be encountered as a result of the offshore operations and presence of Projects' vessels.

28.5.8 This would include any effects which the Projects might have on the lights and shapes to be carried by vessels (e.g., interference to the visibility of navigation lights), on navigation marks ashore and at sea, and to the light and sound signals made by vessels and navigational aids in particular circumstances.

28.5.9 The approach for hazard identification would comprise a combination of both qualitative and analytical techniques, the aim being to identify all relevant hazards. Where relevant, consultation would be undertaken with stakeholders to help to identify and discuss hazards.

Risk Analysis

28.5.10 The risk analysis introduces the concept of risk in a qualitative way in order to prioritise the hazards identified during the hazard identification process and assess their impact on navigational safety.

28.5.11 Risk is the combination of frequency and consequence which are defined in Table 28-5 and Table 28-6 below. The definitions below, developed using the IMO guidelines, would be used and examine effects on human safety and ships as well as displacement of existing vessels (as this is the most likely consequence of the Projects).

Table 28-5: Frequency of a Hazard

Frequency Value	Description	Definition
1	Extremely Remote	Likely to occur once in the lifetime of the Projects (e.g. 25 years)
2	Remote	Likely to occur once per year
3	Probably	Likely to occur once per month
4	Very Probable	Likely to occur once per week
5	Frequent	Likely to occur once per day

Table 28-6: Consequence of a Hazard

Consequence Value	Description	Definition		
		Effects on Human Safety	Effect on Ship(s)	Displacement of Vessel(s)
1	Minor	Single or minor injuries	Single local equipment damage	Temporal displacement of vessel (hours)
2	Significant	Multiple minor injuries	Multiple local equipment damage	Temporal displacement of vessel (days)
3	Severe	Multiple or severe injuries	Non-severe ship and equipment damage	Temporal displacement of vessel (weeks)
4	Serious	Single fatality or multiple severe injuries	Severe damage to ship and equipment	Temporal displacement of vessel (months)
5	Catastrophic	Multiple fatalities	Total loss of ship and equipment	Permanent displacement of vessels

Risk Assessment

28.5.12 To undertake the risk assessment, a risk matrix approach would be utilised that has been adapted from the guidance, which examines the frequency and consequence of a hazard to determine the combined risk. The risk matrix contains risk ratings based on both the consequence and the frequency of the hazard. Risk ratings are calculated using Table 28-7, which can be interpreted using Table 28-8.

28.5.13 Where the frequency of a hazard has been assessed as extremely remote and the consequence assessed as minor, the risk can be said to be negligible. On the other end of the scale, where hazards are assessed as frequent and the consequence catastrophic, then risk is intolerable.

Table 28-7: Risk rating matrix based on the consequence and frequency of the risk

		Consequence				
		Minor	Significant	Severe	Serious	Catastrophic
Frequency	Extremely Remote	1	2	3	4	5
	Remote	2	4	6	8	10
	Probable	3	6	9	12	15
	Very Probable	4	8	12	16	20
	Frequent	5	10	15	20	25

Table 28-8: Definition of risk levels

Score	Classification	Definition
1-2	Negligible	A hazard which causes noticeable changes in the navigation environment but without effecting its sensitivities. Generally considered as insignificant.
3-4	Minor	A hazard that alters the character of the navigation environment in a manner that is consistent with existing baseline. Hazards are generally considered as minor and adequately controlled by best practice and legal controls. Opportunities to reduce hazards further through mitigation may be limited and are unlikely to be cost effective.
5-9	Moderate	A hazard which, by its frequency and consequence alters the aspect of the navigation environment. Generally considered as Moderate but effects are those, considered to be tolerable. However, it is expected that the hazard has been subject to feasible and cost-effective mitigation and has been reduced to ALARP and that no further measures are feasible.

10-14	Major	An effect which, by its frequency and consequence alters most of the aspects of the navigation environment. Generally regarded as unacceptable prior to any mitigation measures being considered.
15-25	Intolerable	Regarded as unacceptable prior to any mitigation measures being considered.

28.5.14 After determining the risk ratings for each hazard before and after mitigation measures, the resultant risk matrix is split into two halves. The first describes the frequency and consequences before mitigation (inherent risk); the second half describes the frequency and consequences after mitigation measures have been applied (residual risk).

Mitigation

28.5.15 The risk assessment reviews existing hazards and their associated mitigation measures, including compliance with best practices, regulations and guidance. This review will identify if new mitigation measures or changes to existing mitigation measures are required e.g., where there are gaps in existing procedures and where mitigation needs to be enhanced.

28.5.16 Care will be taken to ensure that any new hazards created as a result are themselves identified and managed. The overall risk to the existing baseline during this stage will allow recommendations to be made to enhance safety.

28.5.17 A standard hierarchical approach to identifying mitigation requirements will be used to inform the NRA as follows:

- Avoid/Prevent: In the first instance, mitigation will seek to avoid or prevent the adverse effect at source for example, by recommending how the Projects could be routed away from a hazard;
- Reduce: If the effect is unavoidable, mitigation measures will be recommended which seek to reduce the significance of the hazard; and
- Offset: If the hazard can neither be avoided nor reduced, mitigation will be recommended to offset the hazard through the implementation of compensatory mitigation.

28.5.18 All mitigation recommended will be appropriate, feasible and cost-effective, will have been agreed and confirmed with stakeholders and all relevant parties.

28.5.19 Mitigation measures fall into two categories: mitigation which forms part of the Projects' design, taking industry standard practice and design methodology into account which reduce risk, which are referred to as Embedded Mitigation; and mitigation measures which have been proposed as part of the design and construction processes of the Projects to mitigate project-specific hazards that have been identified, which are referred to as Project Specific Mitigation.

28.5.20 The result of using this matrix approach is to ensure that the level of risk is reduced to ALARP for the effects that the Projects have on the baseline shipping environment. Risk ratings are undertaken prior to any mitigation and details the inherent risk. Embedded and Project Specific Mitigation will then be applied to generally reduce the risks to ALARP to determine residual risk ratings post-mitigation.

Risk Control

28.5.21 The aim of assessing the Projects' operations on the existing shipping baseline is to reduce risk to ALARP.

28.5.22 The risk assessment is repeated taking into consideration the application of both Embedded Mitigation and Projects Specific Mitigation, determining the risk level of the hazard with mitigation applied. When the risk assessment is undertaken after mitigation is applied, the resulting risk level is referred to as ALARP.

28.5.23 Risks that have been assessed as Major or above after considering mitigation will normally require additional analysis and consultation to discuss and possibly further mitigate hazards where possible. Where further mitigation is not possible a residual hazard may remain and will be clearly noted in the NRA.

28.6 Scope of Assessment

28.6.1 A range of potential impacts on shipping and navigational features have been identified which may occur during the construction, operation & maintenance, and decommissioning phases of the Projects. Table 28-9 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the NRA and EIA. A precautionary approach has been taken and where there is no strong evidence base, or the risk is uncertain at this stage the impact has been scoped 'in' to the NRA/EIA. Where there is a clear evidence base that the risk from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped out of the NRA as part of the EIA.

Table 28-9: Scoping assessment of impacts on Shipping and Navigation

Potential Impacts	Possible Hazards	Project Activities	Sensitive Receptors	Scoping Justification		
				Construction	Operation (including repair and maintenance)	Decommissioning
Impact on Human Safety	Vessel collisions	Mobilising project vessels	Vessel crew	**IN** - An increased collision risk is associated with the construction phase for all passing traffic due to the presence of the vessels associated with the cable installation. The nature of cable installation and other construction activities requires large, slow-moving vessels which will be restricted in their ability to manoeuvre. The collision risk is likely to be greater in higher density shipping areas, in particular within shipping channels.	**IN** - A collision risk is associated with the operational phase for vessels involved in maintenance works. However, this is expected to be a lesser risk than for construction vessels as maintenance works are likely to be of a shorter duration and at specific locations rather than the whole route.	**IN** - The significance of the risk during decommissioning is lower magnitude than construction but cannot be scoped out as there would be an increased number of vessels in the area during decommissioning.
Impact on Human Safety	Reduced visibility	Mobilising project vessels in extreme weather conditions	Vessel crew	**IN** – Reduced visibility may occur due to extreme weather conditions, which can be unpredictable in the North Sea. During the cable lay process, this could mean cutting and buoying the cable in a situation that is too dangerous to continue working.	**IN** – Reduced visibility may occur due to extreme weather conditions, which can be unpredictable in the North Sea. However, this risk is anticipated to be lower than for construction vessels due to shorter operation duration.	**IN** – Reduced visibility may occur due to extreme weather conditions, which can be unpredictable in the North Sea. However, this risk is anticipated to be lower than for construction vessels.
Impact on Navigational Safety & Features	Anchor strike/drag	Surface laying cable	Subsea cables	**IN** – The risk of accidental anchor strike or drag over surface-laid cable is low in the construction phase due to notices and presence of Projects' vessels. There is a small risk of emergency anchoring of Projects' vessels.	**IN** – The risk of accidental anchor strike or drag over surface-laid/exposed cable is highest in the operational phase, as cable exposures may have occurred due to mobile sediment/scour.	**IN** – There is a very low risk of accidental anchor strike over surface-laid/exposed cable during decommissioning, associated with the emergency anchoring of Projects' vessels.
Impact on Navigational Safety & Features	Fishing gear snagging & Anchor strike/drag	Cable crossing	Third-party assets	**IN** – The risk of fishing gear snagging or accidental anchor strike or drag on third-party assets is low in the construction phase due to notices and presence of Projects' vessels. There is a small risk of emergency anchoring of Projects' vessels. The risk is additionally low since the Projects will enter into crossing agreements and/or proximity agreements with third-party asset owners. Installation crossing designs will be in accordance with these	**IN** – There is a minor increase in risk for anchor strike and fishing gear snagging on third-party assets during the operational phase, as cable exposures may have occurred due to mobile sediment/scour.	**IN –** The risk of fishing gear snagging or anchor strike/drag on third-party assets is very low, as decommissioning will be carried out in accordance with the third-party asset agreements to mitigate risks.

Potential Impacts	Possible Hazards	Project Activities	Sensitive Receptors	Scoping Justification		
				Construction	**Operation (including repair and maintenance)**	**Decommissioning**
				agreements and will ensure both appropriate separation and protection.		
Impact on Human Activities	Fishing gear snagging	Post-installation	Fishing vessels & Fisheries	**IN** – The risk of fishing gear snagging is extremely low in the construction phase due to notices and presence of Projects' vessels.	**IN** – The risk of fishing gear snagging is highest in the operational phase once fishing vessels resume activities in the area.	**IN** – The risk of fishing gear snagging is extremely low in the decommissioning phase.
Displacement of Vessels	Project vessels blocking navigational features	Mobilising project vessels	Vessels travelling to/from anchorages and port approaches	**IN** – There is a high risk of Projects' vessels blocking navigational features during construction, such as anchorages or approaches to ports, causing some displacement of other marine users.	**IN** – There is a small risk of Projects' vessels blocking navigational features during operation, such as anchorages or approaches to ports, causing some minor displacement of other marine users at a small-scale.	**IN** – There is a small risk of Projects' vessels blocking navigational features during decommissioning, such as anchorages or approaches to ports, causing some minor displacement of other marine users at a small-scale.
Displacement of Vessels	Disturbance to existing shipping patterns	Mobilising project vessels	Vessels	**IN** – The risk of disturbing existing shipping patterns during construction is highest, as vessels may have to re-route around or reduce speed on approach to the project vessels which may lead to a temporary disturbance.	**IN** – The risk of disturbing existing shipping patterns during the operational phase is low, as there a few vessels required to undertake repairs and maintenance which results in a minor temporary disturbance to existing shipping patterns.	**IN** – The risk of disturbing existing shipping patterns during the decommissioning phase is low, as there a few vessels required which results in a minor temporary disturbance to existing shipping patterns.
Impact on Human Activities	Reduction in under-keel clearance	Post-installation	Vessels	**IN** - There is a low risk of reduction in under-keel clearance during construction only associated with Projects' vessels.	**IN** – The risk of reduction in under-keel clearance is highest during the operational phase due to the presence of cable protection measures that reduce the navigable water depth for vessels.	**IN** - There is a low risk of reduction in under-keel clearance during decommissioning only associated with Projects' vessels.
Impact on Human Activities	Interference with marine navigation equipment	Post-installation	Vessels	**OUT -** There is no risk of electromagnetic forces from the cable causing magnetic compass deviations in the construction phase.	**IN –** The risk of electromagnetic forces from the cable causing deviations in magnetic compasses is highest in the operational phase once the cable is in place and other marine users can traverse the marine corridor, potentially disrupting navigation	**OUT -** There is no risk of electromagnetic forces from the cable causing magnetic compass deviations in the decommissioning phase.

28.7 References

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28.7.2 IMO (2015) Revised Guidelines for the Onboard Operational Use of Shipborne Automatic Identification Systems (AIS). Resolution A.1106(29). Published 14/12/2015. Available at: https://wwwcdn.imo.org/localresources/en/OurWork/Safety/Documents/AIS/Resolution%20A.1106(29).pdf

28.7.3 IMO (2018) Revised guidelines for Formal Safety Assessment (FSA) for Use in the IMO Rule-Making Process - MSC-MEPC.2/Circ.12/Rev.2. Published on 09/04/2018. Available at: https://wwwcdn.imo.org/localresources/en/OurWork/HumanElement/Documents/MSC-MEPC.2-Circ.12-Rev.2%20-%20Revised%20Guidelines%20For%20Formal%20Safety%20Assessment%20(Fsa)For%20Use%20In%20The%20Imo%20Rule-Making%20Proces...%20(Secretariat).pdf

28.7.4 Intertek (2023a) Eastern Green Link 3 Cable Routeing Report Background. P2601_R6168_Rev0_EGL3_RouteingReport.

28.7.5 Intertek (2023b) Cable Burial Risk Assessment: Eastern Green Link 3. P2601_R6264_Rev0_EGL3_CBRA

28.7.6 Intertek (2023c) Eastern Green Link 4 Cable Routeing Report Background. P2602_R6170_Rev0_EGL4_RouteingReport.

28.7.7 MGN (2021) MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response. Published on 28/04/2021. Available at: https://www.gov.uk/government/publications/mgn-654-mf-offshore-renewable-energy-installations-orei-safety-response

28.7.8 Renew, D. (2022) Sea Link EMF Assessment April 2022. Available at: https://www.nationalgrid.com/electricity-transmission/document/151706/download

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29. Commercial Fisheries

nationalgrid

29. Commercial Fisheries

29.1 Study Area Definition

29.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Projects on commercial fisheries. Commercial fisheries receptors include pelagic (species that live within the water column), demersal (species live and feed on or near the bottom of seas or lakes), and shellfish (crustaceans and molluscs.)

29.1.2 The Study Area for this receptor includes the Scoping Boundary plus an additional 15 km buffer either side. This is a precautionary maximum zone of influence that encompasses the potential impact pathways from underwater noise and increased suspended sediment concentrations. It will be reviewed and refined for the EIA based on maximum tidal excursions and if appropriate sediment dispersion modelling. The zone of influence will be influenced by the conclusions of Part 3, Chapter 23 – Marine Physical Processes, and this chapter should be read in conjunction with these findings.

29.2 Data Sources

29.2.1 Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

29.2.2 Extensive information is available to characterise the commercial fisheries of the North Sea. Following a detailed review to inform the scope of the data and assessment, as presented, no site-specific surveys are planned for this topic.

Publicly Available Data

29.2.3 Desk based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Table 29-1 lists the key data sources which will be used in the assessment.

Table 29-1: Key publicly available data sources for commercial fisheries

Data Source	Description
IFCA	Website with information about fishing and the species in the different regional IFCAs
EA	Transitional and Coastal Waters (TraC) Fish Monitoring Programme
Department of Energy & Climate Change (DECC) (2022)	Offshore Energy Strategic Environmental Assessment 4 (OESEA4)

Data Source	Description
MMO (MMO, 2023)	UK Sea Fisheries annual statistics report 2022 and accompanying datasets which includes species catch list for the relevant ICES rectangles. https://assets.publishing.service.gov.uk/media/6512f96df6746b0012a4ba77/UK_Sea_Fisheries_Statistics_2022_.pdf Landings statistics for the period 2018- 2022 Aerial surveillance data for the period 2018- 2022
VMS data	VMS data for the period 2018 - 2022
EMODnet	Interactive reference website which shows fish abundance and distribution. http://www.emodnet.eu/biology
FishBase	Species reference website www.fishbase.org
Regional Inshore Fisheries Groups (RIFGs)	Scottish commercial fishers' forum to explore local fisheries management initiatives. https://rifg.scot/
JNCC	Species specific data, of native species of conservation interest UK BAP List of UK Priority Species | JNCC Resource Hub
Brown & May Marine Ltd (2023)	Eastern Green Link Three and Four Transmission Reinforcement Cable Projects: Fishing Activity Report
IUCN	The International Convention for the Conservation of Nature (IUCN) Red List of Threatened Species (https://www.iucnredlist.org/)
Eastern Green Link 2 Marine Scheme	Environmental Appraisal report for the EGL 2 project. (Marine Licence Application - SEGL/Eastern Link 2 HVDC Cable and Cable Protection - Peterhead to Drax - 00009943 | Marine Scotland Information)

Additional Studies

Commercial Fishing Activity

29.2.4 A study to assess commercial fishing activity was undertaken by Brown and May Marine Ltd in March 2023 to understand the spatial and temporal distribution of fishing activity within the Study Area. Alongside this, and to inform the EIA, interviews with local and regional fisheries stakeholders have been conducted to obtain additional information on fishery statistics such as fishing vessels operating in the area, types and sizes of vessels, fishing gear(s) used, fishing effort, target species, seasonality in effort or species abundance, and location of key grounds. The interviews will be supplemented by a desk-based review of catch and effort statistics. AIS data from UK and European fishing vessels over 15 m in length and VMS data from UK registered commercial fishing vessels over 12 m in length will also be obtained and interrogated to assess the distribution of fishing effort. Aerial surveillance data gathered by the MMO will also be used to augment a qualitative assessment of the smaller fishing boats operating in the area. Information will also be sought from the relevant IFCA's including Eastern, North-Eastern and Northumberland.

Fisheries Liaison and Mitigation Action Plan (FLMAP)

29.2.5 A Fisheries Liaison and Mitigation Action Plan will be written which will outline how the applicant will interact with all the legitimate sea users prior and during any works on the Projects. This will be written by the FLO for the Projects.

Other Relevant Studies

29.2.6 To inform the EIA an EMF study and a Sandeel & Atlantic herring habitat assessment will be carried out to inform the fish and shellfish assessment. Although not directly applicable to commercial fisheries these studies inform the assessment of the significance of impacts on fish and shellfish and therefore the implications for commercial fisheries targeting those resources. They are described in full in Part 3, Chapter 25.

29.3 Consultation

29.3.1 The scope of the commercial fisheries chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. This chapter was well received by consultees, with no suggestions for updates received.

29.3.2 Further consultation to inform the EIA will be undertaken with fisheries stakeholders to supplement the desk-top review and studies. The following bodies will be consulted, as a minimum, to ensure that the most up-to-date information is collated:

- MMO
- Cefas
- Environment Agency
- NFFO
- IFCA - Eastern, North-Eastern and Northumberland
- North Shields Fishermen’s Association
- Individual Fishers

29.4 Baseline Characterisation

Introduction

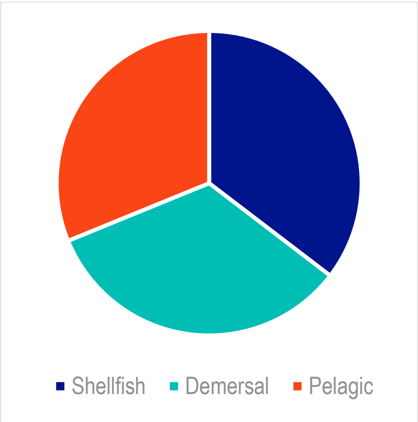
29.4.1 This section describes the key commercial fisheries along the Projects; the local fishing fleet; any fishing restrictions; and provides landings data to contextualise the value of the fishing industry in the region for the purposes of reviewing the proposed scope of the assessment and data collection approach that will be adopted in the EIA.

29.4.2 The section has been informed by the latest publicly available catch statistics available from the MMO (MMO 2023), AIS and VMS data and consultation undertaken by CEA and the FLO for the Projects with local fishing organisations and vessels. It should be noted that AIS, VMS and landings data derived from MMO catch statistics only provide a general overview of fishing effort, and do not accurately reflect the effort in the region i.e., not all vessels will carry AIS, and smaller vessels do not directly report landings data to the MMO. However, NGET considers that the combination of data and consultation undertaken to inform the EIA would provide an appropriate characterisation of the receiving environment in which the Projects will be constructed, which is adequate for the purposes of the EIA.

29.4.3 The number of fishers working on UK registered vessels is approximately 10,000, a figure which has been decreasing over the last 10 years from approximately 12,000. The number of UK registered vessels has also decreased by 14% in the last 10 years with now only 5541 UK Registered vessels. In 2022, UK vessels landed 640,000 tonnes of sea fish with an overall value of £1.04 billion. This is a decrease of 2% on the quantity caught in 2021, but an increase of 13% in value due the high fish prices particularly shellfish and demersal species. Multiple factors have had an impact on fishing and landings which tend to fluctuate considerably over time. However, since 2020 the largest impact on sea fisheries has been the UK's departure from the EU. This has impacted the stocks that the UK fleet had access to fish (MMO, 2023).

29.4.4 Figure 29-1 illustrates the overall 2022 landings value in Great British Pounds (GBP), which indicates that they are approximately shared equally between the three types of species. Figure 29-2 illustrates the overall 2022 landing by weight in tonnes which shows that the pelagic species catch accounts for 60% but accounted for just under a third of the value. This is due to the lower price for pelagic species.

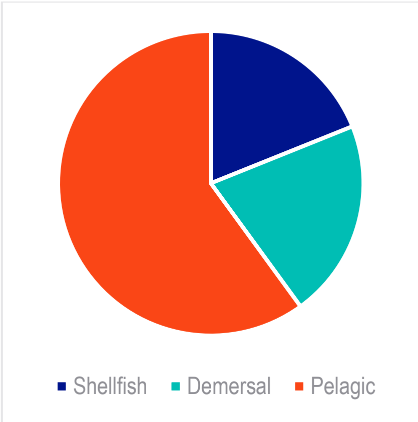
Figure 29-1: UK 2022 Landing by species type by value (GBP)



29.4.5

Source: MMO 2023

Figure 29-2: UK 2022 Landing by species type in tonnes



29.4.6

Source: MMO 2023

29.4.7 In 2022, UK vessels landed 245,000 tonnes of fish overseas, 50% of which were to Norway. This is 38% of the total quantity of fish landed by UK vessels and represents 24% of the value of all fish landed by UK vessels. Most landings abroad are of pelagic fish species accounting for 90% of landings, 52% of which was mackerel.

Overview of Fisheries within the Study Area

29.4.8 The Projects cross several different commercial fishing areas. To enable accurate monitoring of commercial fisheries the sea is divided into ICES Rectangles (ICES, 2022). The Projects lie within nine of these rectangles, namely 35F0, 36F0, 37F0, 38E9, 38F0, 39E9, 40E9, 40E8 and 41E9. Analysis of the fishing data for these nine rectangles has been used as an indication of the commercial fish species caught in these regions.

29.4.9 The North Sea is home to important fishing grounds used not only by the local English fleet but also by international vessels from Belgium, the Netherlands, Denmark, France, Ireland, Spain and Germany. However, the majority of this occurs in ICES rectangles next to the Projects' Scoping Boundary further offshore.

Shellfish

29.4.10 The Shellfish industry within the North Sea is of significant importance and contributes to approximately 96% of the catch values in the Study Area. The majority of shellfish caught uses static gear such as pots/creels and traps which target species such as crabs (*Cancer pagurus* and *Necora puber*), lobsters (*Homarus gammarus*) and whelks (*Buccinum undatum*).

29.4.11 Other shellfish species such as nephrops also known as Norway Lobster (*Nephrops norvegicus*), squid (*Alloteuthis subulata*), and octopus (*Octopus vulgaris*) are caught using demersal trawl gear. It should be noted that fishers are required to have licenses to catch shellfish which is obtained from the MMO. Beam trawl gear is also used to target brown shrimp (*Crangon crangon*) and Aesop shrimp (*Pandalus montagui*); primarily in ICES rectangle 35F0.

29.4.12 King scallop (*Pecten maximus*) is another highly targeted species within the Study Area which is caught using dredge gear. It should be noted that the scallop fishery is cyclical in nature with the production grounds rotating around the UK on a seven-to-eight-year cycle. Due to the cyclical nature other cable and offshore wind farm projects within the study area have been asked to gather and analyse data over an eight-year period to be able to monitor scallop populations more effectively. The main landing port for scallops in the Study Area is Hartlepool.

29.4.13 Cockle fishing (*Cerastoderma edule*) is an important and highly valuable sector of the commercial fishing industry in the region with highly productive cockle grounds located in The Wash. The main landing ports for cockles are at Boston and Kings Lynn. The Wash Cockle Fishery is regulated by the Eastern Inshore Fisheries and Conservation Authority (EIFCA) which has set times when cockle fishing is permitted and strict Total Allowable Catch (TAC) set for the year (EIFCA, 2019). Permits are required to fish cockles in this area. They can be caught using various methods including dredge, other mobile gears and pots and traps, primarily in ICES rectangle 35F0.

29.4.14 Table 29-2 summarises shellfish catch seasonality within the Study Area.

Table 29-2: Shellfish catch seasonality

Feature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brown Shrimp												
Cockles												
Crabs												
Lobster												
Scallops												
Squid												
Whelks												

Key		High Season			Low Season

Source: Direct Seafoods (2023)

29.4.15 Analysis of landings data (MMO, 2023) shows that the port of Bridlington lands the highest value of shellfish of any port within the Study Area. Landings peak during the period from July to October in Bridlington.

Demersal Fish

29.4.16 A variety of demersal (bottom contact) trawl gear methods are used in the North Sea to target demersal whitefish species such as whiting (*Merlangius merlangus*), haddock (*Melanogrammus aeglefinus*), halibut (*H. hippoglossus*), sole (*Solea solea*), cod (*Gadus morhua),* and plaice (*Pleuronectes platessa*). They are fished not only by the UK fleet but also by international vessels from Belgium, the Netherlands, Denmark, France, Ireland, Spain and Germany.

29.4.17 Beam trawling is used in the North Sea by UK registered vessels for catching brown shrimp, however they are more commonly used by the Belgian vessels and occasionally by the Dutch vessels. Fly seine netting is a more recent alternative to the traditional heavy beam trawling due to the depleted fish stocks. Bottom drift nets are now rarely used by the UK fleet with very limited catches using this gear type.

29.4.18 Analysis of landing data (MMO, 2023) shows that the port of North Shields is the most important port for landings of demersal whitefish caught within the Study Area. Landings peak during the period from September to December in North Shields.

Pelagic Fish

29.4.19 The North Sea pelagic catch are shoaling fish species such as herring (*Clupea harengus*), mackerel (*Scomber scombrus*) and horse mackerel (*Trachurus trachurus*). They are caught using demersal seine and demersal trawl gears, but primarily handlines. Many of the large catches of herring are landed in Norway and the Netherlands rather than UK ports.

Key Gear Types

29.4.20 Five gear types have been identified within the Scoping Boundary. Table 29-3 shows the KP points where the types of gear are predominantly used with the Scoping Boundary.

Table 29-3: Key fisheries that spatially overlap with the Scoping Boundary

Fishery	Gear Type	KP points - spatial overlap between the fishery and EGL 3	KP points – spatial overlap between the fishery and EGL 4
1	Static Gears	3_KP 0 – 3_KP 6, 3_KP 12 – 3_KP 259, 3_KP 265 – 3_KP 283, 3_KP 288 – 3_KP 294, 3_KP 296 – 3_KP 298, 3_KP 302 – 3_KP 315, 3_KP 319 –3_ KP 325 T3_KP 0 – T3_KP 17 H3_KP 0 – H3_KP 40	4_KP 0 – 4_KP 6, 4_KP 12 – 4_KP 24, 4_KP 25 – 4_KP 227, 4_KP 236 – 4_KP 259, 4_KP 262 – 4_KP 274, 4_KP 278 – 4_KP 281, 4_KP 286 – 4_KP 317 T4_KP 0 – T4_KP 12, T4_KP13 – T4_KP 14 H4_KP 0 – H4_KP 39
2	Dredging	3_KP 59 – 3_KP 71, 3_KP 92 – 3_KP 97, 3_KP 100 – 3_KP 105, 3_KP 139 – 3_KP	4_KP 21 – 4_KP 24, 4_KP 35 – 4_KP 41, 4_KP 51, 4_KP 59 – 4_KP 60, 4_KP 63 –

Fishery	Gear Type	KP points - spatial overlap between the fishery and EGL 3	KP points – spatial overlap between the fishery and EGL 4
		143, 3_KP 148 – 3_KP 166, 3_KP 172 – 3_KP 177, 3_KP 184, 3_KP 190 – 3_KP 195, 3_KP 208 – 3_KP 214, 3_KP 307 – 3_KP 313, 3_KP 327 – 3_KP 342 T3_KP 0 – T3_KP 4, T3_KP 6.5 – T3_KP 12 H3_KP 2 – H3_KP 3, H3_KP 8 – H3_KP 32	4_KP 70, 4_KP 74 – 4_KP 80, 4_KP 85 – 4_KP 91, 4_KP 92 – 4_KP 101, 4_KP 109, 4_KP 134 – 4_KP 135, 4_KP 138 – 4_KP 167, 4_KP 168 – 4_KP 180, 4_KP 186 – 4_KP 191, 4_KP 203 – 4_KP 209, 4_KP 323, 4_KP 367 – 4_KP 373, 4_KP 374 – 4_KP376, 4_KP 383 – 4_KP 403 T4_KP 0 – T4_KP 4, T4_KP 6 – T4_KP 12 H4_KP 2 – H4_KP 13, H4_KP 20 – H4_KP 24, H4_KP 27 – H4_KP 32, H4_KP 34 – H4_KP 38
3	Pelagic Trawl	3_KP 24 – 3_KP 31, 3_KP 35 – 3_KP 38, 3_KP 85 – 3_KP 95, 3_KP 97 – 3_KP 113, 3_KP 114 – 3_KP 273, 3_KP 277 – 3_KP 282, 3_KP 297 – 3_KP 302, 3_KP 307 – 3_KP 359, 3_KP 420 – 3_KP 427 T3_KP 13 – T3_KP 17 H3_KP 38 – H3_KP 40	KP 25 – KP 32, KP 35 – KP 40, KP 50, KP 91 – KP 99, KP 100 – KP 103, KP 108 – KP 259, KP 265, KP 275 – KP 278, KP 289 – KP 356, KP 363 – KP 369, KP 373 – KP 376, KP 393 – KP 396 T4_KP 13 – T4_KP 14 H4_KP 34 – H4_KP 39
4	Bottom Otter Trawl	3_KP 0 – 3_KP 2, 3_KP 38 – 3_KP 46, 3_KP 48 – 3_KP 53, 3_KP 62 – 3_KP 69, 3_KP 97 – 3_KP 113, 3_KP 114 – 3_KP 288, 3_KP 298 – 3_KP 302, 3_KP 307 – 3_KP 336, 3_KP 365 – 3_KP 366, 3_KP 392 – 3_KP 420 T3_KP 0 – T3_KP 4 H3_KP 38 – H3_KP 40	4_KP 0 – 4_KP 2, 4_KP 67– 4_KP 70, 4_KP 74 – 4_KP 80, 4_KP 92 – 4_KP 100, 4_KP 109 – 4_KP 268, 4_KP 274 – 4_KP 278, 4_KP 303 – 4_KP 317, 4_KP 323 – 4_KP 329, 4_KP 373 – 4_KP 3, 4_KP 422 T4_KP 0 – T4_KP 4 H4_KP 38 – H4_KP 39
5	Beam Trawling	3_KP 0 – 3_KP 6, 3_KP 7 0 – 3_KP 14, 3_KP 16 – 3_KP 18, 3_KP 121 – 3_KP 128, 3_KP 137 – 3_KP 139, 3_KP 143 – 3_KP 146, 3_KP 148 – 3_KP 166, 3_KP 172 – 3_KP 177, 3_KP 184, 3_KP 223 – 3_KP 228, 3_KP 241 – 3_KP 252, 3_KP 257 – 3_KP 259 T3_KP 0 – T3_KP 7 H3_KP 10 – H3_KP 14, H3_KP 23 – H3_KP 26	4_KP 0 – 4_KP 18, 4_KP 130 – 4_KP 134, 4_KP 133 – 4_KP 150, 4_KP 151 – 4_KP 155, 4_KP 168 – 4_KP 173, 4_KP 244 – 4_KP 250 T4_KP 0 – T4_KP 6

T_KP refer to the submarine cable corridor option to the proposed Landfall site at Theddlethorpe.
H_KP refer to the submarine cable corridor option that crosses the Holderness Offshore MCZ.

UK Fishing Fleet

29.4.21 The UK fishing industry is worth over £1 billion annually from a catch of over 640,000 tonnes, therefore as an important part of the economy is regulated by the government. The MMO registers all UK vessels on a monthly basis. The fleet is split into two categories: under 10 m in length and over 10 m in length. The UK registered fleet of vessels under 10 m in length comprises 3827 vessels as of August 2023 (MMO, 2023a). Of this, 2574 vessels are licensed to catch shellfish equating to 67% of vessels. Of the under 10 m vessels 1933 vessels are registered as English with the remainder registered as Welsh, Scottish or Northern Irish.

29.4.22 The UK registered fleet of vessels over 10 m in length comprises 1028 vessels as of August 2023 (MMO, 2023b). Of this, only 323 vessels are licensed to catch shellfish which is 31% of the over 10 m vessels. The other 69% vessels target demersal or pelagic species. Of the vessels over 10 m, 437 are registered as English with the remainder registered as Welsh, Scottish or Northern Irish.

29.4.23 Table 29-4 shows the overall catch information for the UK in 2022 broken down by species type of percentage of overall catch, weight and catch value.

Table 29-4: Overall catch information for the UK in 2022

Species Type	Percentage	Catch weight in tonnes	Catch value in GBP
Demersal	21 %	135,000	£350 million
Pelagic	60%	384,000	£332 million
Shellfish	19%	121,000	£377 million

29.4.24 The English fleet operates from ports across England, with the three key ports being Newlyn with a catch value of over £38 million, Brixham £45 million, and Shoreham £18 million. Newlyn lands the highest quantity; and Brixham the highest value in GBP.

29.4.25 Figures 29-3 and 29-4 show the top 5 ports within the Study Area with catch values for vessels under 10 m and over 10 m in length respectively.

Figure 29-3: Top 5 ports in the Study Area for under 10 m vessel catches: Source: MMO (2023)

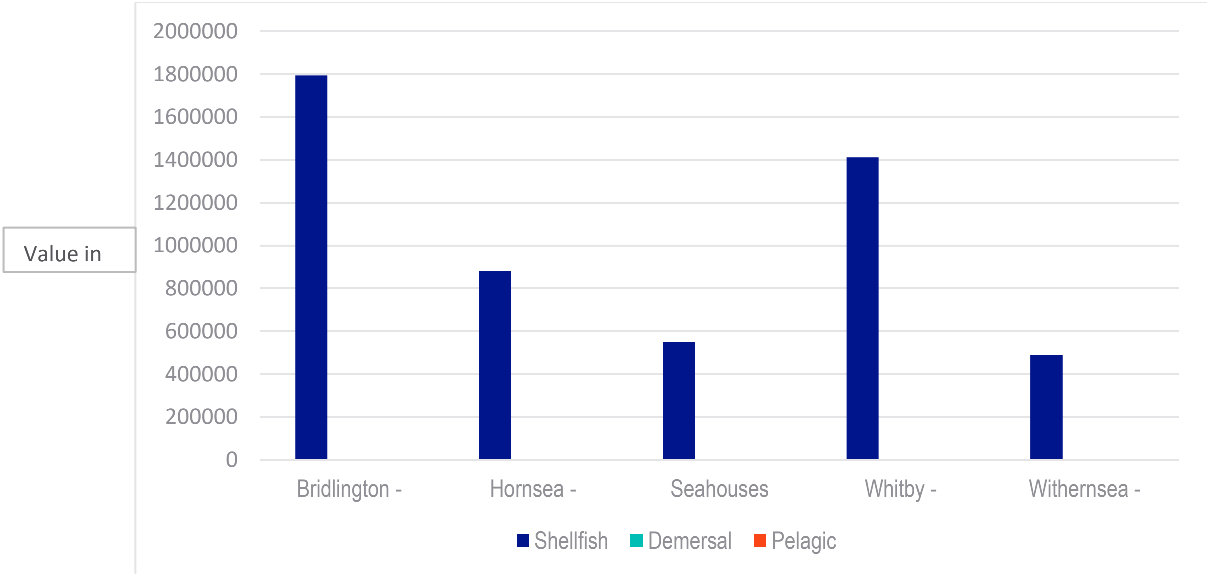
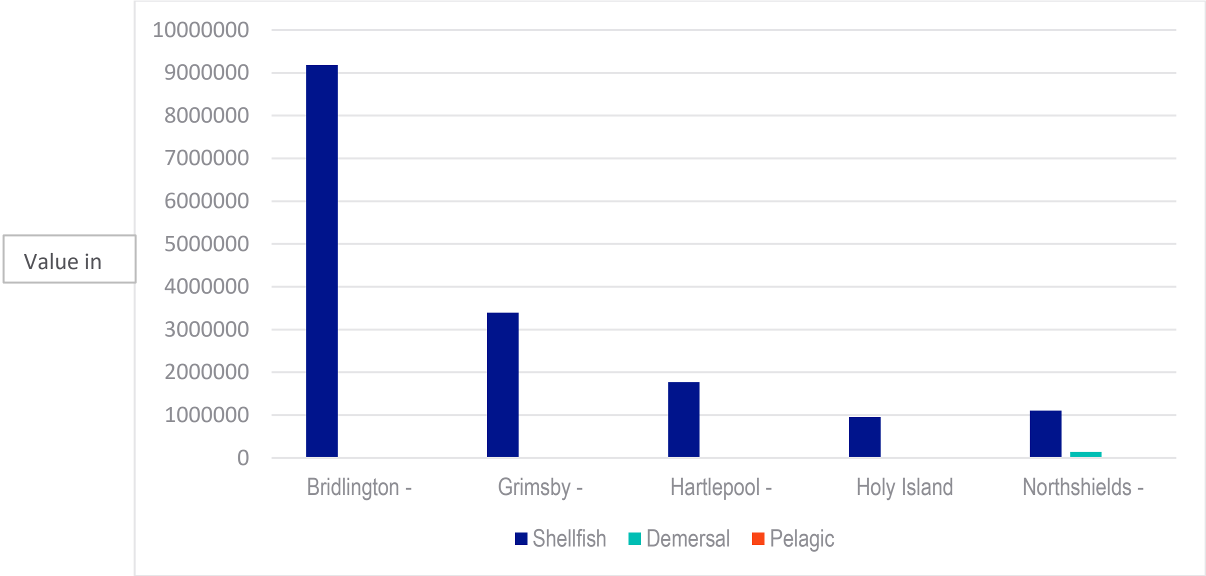


Figure 29-4: Top 5 Ports in the Study Area for over 10 m Vessel catches. Source: MMO (2023)



Local Fishing Fleet

29.4.26 UK vessels of less than 17 m in length and with less than 300 hp (221 kW) are permitted to fish inside the 6-mile fishery limit, with some fishing restrictions. Based on the MMO's UK Fishing Vessel Registry list from August 2023, it is estimated that there are total of 343 registered and licensed fishing vessels operating in the vicinity of the Study Area. Of these vessels 252 were under 10 m in length and are not currently required to have VMS onboard.

29.4.27 224 of the under 10 m vessels hold licenses to fish shellfish which accounts for 88% of the fleet. 91 vessels are over 10 m in length 46 of these have shellfish licences, which is 50% of the fleet. Additionally, four vessels have licenses to dredge for scallops. This correlates with the catch figures that shellfish is the most caught species within the Study Area, (Figure 29-1 and Figure 29-2).

29.4.28 Consultation with the local fisheries has identified that there are approximately 20-25 vessels actively fishing within the Scoping Boundary.

Landings Data within the Study Area

Overview

29.4.29 A high-level review of landings data from 2018 to 2022 across the nine ICES rectangles relevant to the Study Area provided information on the economic importance of different commercial fish species.

29.4.30 Over the 5-year period (2018 to 2022) over 66,000 tonnes of fish were landed with a value of over £147 million (Table 29-5). Of this value, £33.5 million was landed by under 10 m vessels with the remaining £114 million landed by the over 10 m fleet. Approximately 96% of the total value of landings from all eight rectangles were represented by shellfish. Table 29-5 indicates significant annual variability between catch weight and value; this is reflected in the average value per tonne whereby up until 2022 the price had been steadily decreasing. However, the UK Sea Fisheries Statistics 2022, written by the MMO, note that there has been an overall increase of 13% in the average value per tonne in 2022 due to higher fish prices.

Table 29-5: Annual catch value from 2018 to 2022 for ICES Rectangles within Study Area

Year	Live Weight (Tonnes) 10m or under	Live Weight (Tonnes) over 10m	Value (GBP) Under 10m	Value (GBP) Over 10m	Value per tonne (GBP/tonne)
2018	2704	6928	£6,951,629.00	£20,050,840.00	£2,803.00
2019	2603	8630	£6,879,332.00	£23,147,522.00	£2,673.00
2020	2396	8174	£5,234,772.00	£15,870,183.00	£1,997.00
2021	2092	23850	£7,644,333.00	£32,461,716.00	£1,546.00
2022	1468	7210	£6,862,193.00	£22,536,549.00	£3,388.00
Total for 5yr period	**11263**	**54792**	**£33,572,259.00**	**£114,066,810.00**	
Average	**2252.6**	**10958.4**	**£6,714,451.80**	**£22,813,362.00**	**£2,481.40**

Source: MMO 2023

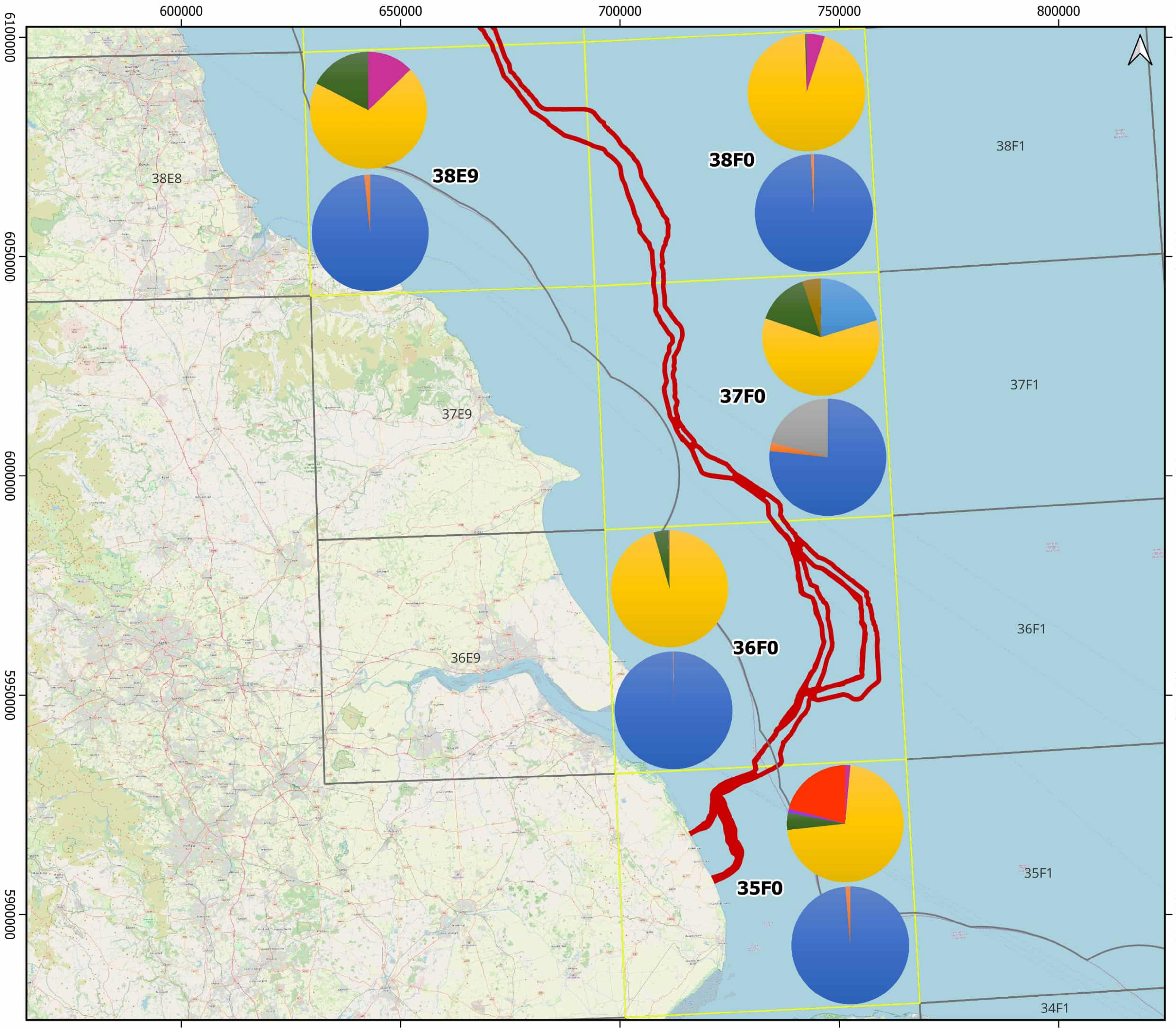
29.4.31 The fishing industry uses various types of fishing gear as described above in Section 29.4.2. Table 29-6 presents the annual catch value by gear type within the Study Area. This table indicates that the over the last five years catch from pots and traps have the greatest value, which as described in other sections of the report demonstrates how important the shellfish industry is to the North Sea.

Table 29-6: Annual catch value (GBP)from 2018 to 2022 by Gear Type for ICES Rectangles within the Study Area

Year	Demersal Trawl	Pelagic Trawl	Pots and Traps	Dredge	Drift and Fixed Nets	Demersal seine	Pelagic Seine	Gears using hooks	Beam Trawl	Other mobile gears
2018	1571428	0	20620841	3458009	2582	1545	0	10826	662826	588867
2019	4273952	1163329	21311762	2667442	0	260214	0	9090	122358	219049
2020	2317067	843079	15088606	1060719	4015	901921	0	6231	220982	661594
2021	1798456	10351185	23617706	2892680	1991	336861	47346	1899	145476	912351
2022	3225534	790384	23165643	1590057	14730	186185	14705	4133	128202	279155
Total	£13,186,437.00	£13,147,977.00	£103,804,558.00	£11,668,907.00	**£23,318.00**	**£1,686,726.00**	**£62,051.00**	**£32,179.00**	**£1,279,844.00**	**£2,661,016.00**

Source: MMO 2023

29.4.32 To illustrate this information further Figure 29-5 (Drawing C01494-EGL3&4-FISH-005), (ICES rectangles 35F0, 36F0, 37F0, 38F0 and 38E9), and Figure 29-6, (Drawing C01494-EGL3&4-FISH-006), (ICES rectangles 39E9, 40E8, 40E9 and 41E9), present fishing activity by species and gear type in 2022 across ICES rectangles.



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Annual Catch by Gear and Species Type in the Study Area - Map 1

C01494-EGL3&4-FISH-005-B

- 12NM Limit
- Scoping Boundary
- ICES Statistical Rectangles
- ICES Statistical Rectangles Intersected by the Scoping Boundary

Gear Type
- Beam Trawl
- Demersal Seine
- Demersal Trawl
- Dredge
- Drift and Fixed Nets
- Gears Using Hooks
- Pelagic Seine
- Pelagic Trawl
- Pots and Traps
- Other Mobile Gears

Type of Fishing
- Demersal
- Pelagic
- Shellfish

0 10 20 NM

0 25 50 km

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:850,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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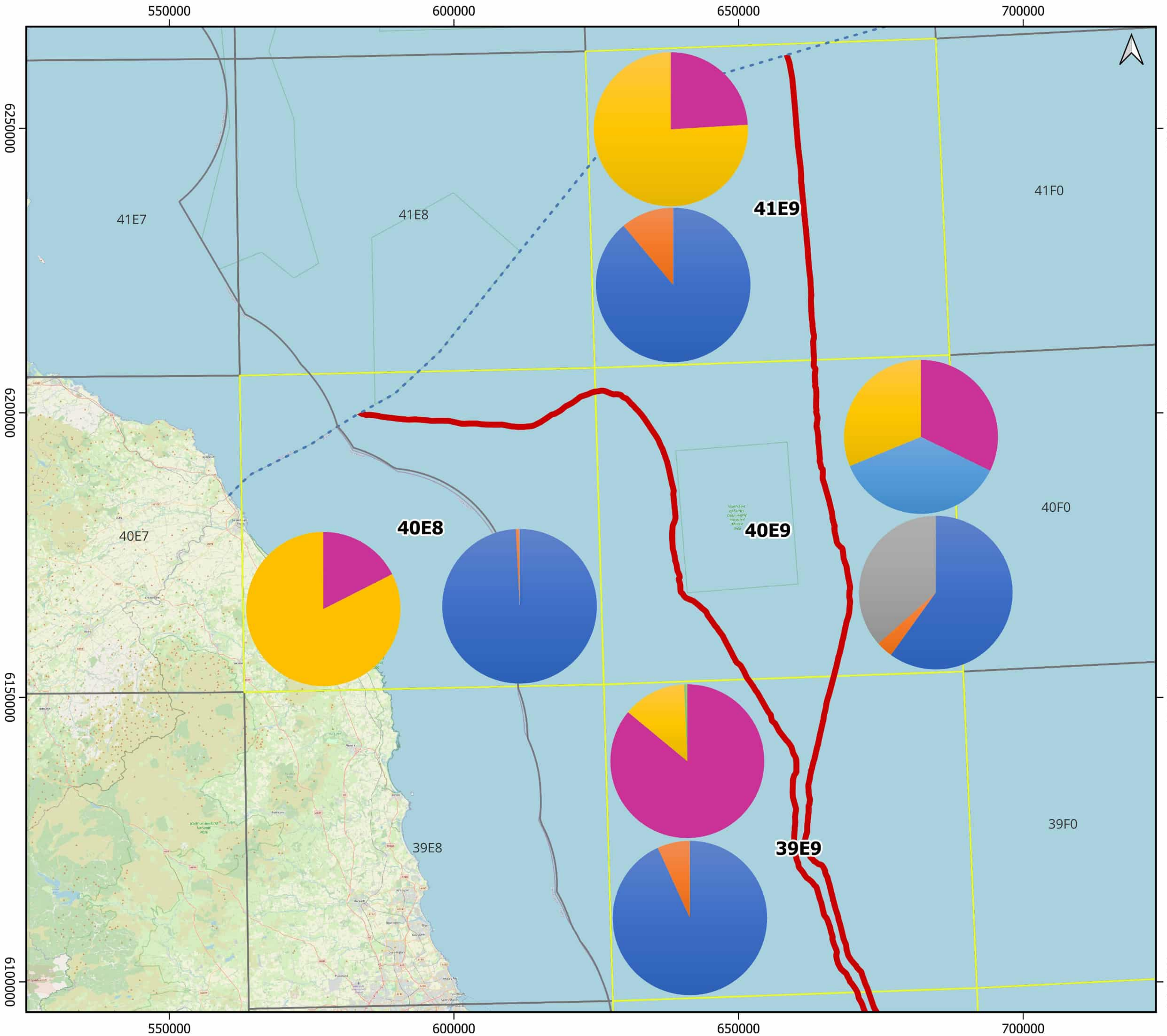
Export Date: 09/07/2024



Annual Catch by Gear Type and Species in the Study Area - Map 2

C01494-EGL3&4-FISH-006-B

- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- ICES Statistical Rectangles
- ICES Statistical Rectangles Intersected by the Scoping Boundary

Gear Type	Type of Fishing
Beam Trawl	Demersal
Demersal Seine	Pelagic
Demersal Trawl	Shellfish
Dredge	
Drift and Fixed Nets	
Gears Using Hooks	
Pelagic Seine	
Pelagic Trawl	
Pots and Traps	
Other Mobile Gears	

0 10 20 NM

0 10 20 km

Date	09/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:650,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

Document Path: X:\GIS\GIS_PROJECTS\C01494_EGL3&4\Project\QGS\EGL3&4\07_FISH\C01494_EGL3&4_FISH_006.qgz

Export Date: 09/07/2024

Landings by Weight and Value

29.4.33 In terms of annual landed weight in 2022 within the Study Area, shellfish is the largest target species representing over 81% of the overall catch. Demersal fishing only accounted for approximately 2.5% and pelagic fishing approximately 16.2%. However, in terms of catch value, shellfish account for approximately 96% with demersal and pelagic at 1.3% and 2.8% respectively. These figures again demonstrate the importance of shellfish fisheries in the North Sea.

29.4.34 Table 29-7 shows the top five species caught within the Study Area. Of the nine rectangles analysed, one rectangle had a non-shellfish species as the top species (herring in 40E9). For all the remaining rectangles, the top valued catch species were either crabs (C.P.Mixed Sexes) in 35F0, 37F0, 38F0 and 41E9, lobsters in 36F0, 38E9 and 40E8 or nephrops in 39E9.

29.4.35 Lobster and halibut are the highest value species followed by nephrops and squid within the North Sea and specifically the Study Area.

Table 29-7: Top five landed species by value (GBP) in 2022 in ICES Rectangles within the Study Area

		ICES Rectangles				
		35F0	**36F0**	**37F0**	**38E9**	**38F0**
Landed Species	1	Crabs (C.P.Mixed Sexes)	Lobster	Crabs (C.P.Mixed Sexes)	Lobster	Crabs (C.P.Mixed Sexes)
	2	Cockles	Crabs (C.P.Mixed Sexes)	Lobster	Crabs (C.P.Mixed Sexes)	Lobsters
	3	Whelks	Scallops	Herring	Scallops	Nephrops
	4	Lobster	Whelks	Scallops	Nephrops	Halibut
	5	Brown shrimp	Velvet crab	Squid	Monks and Anglers	Scallops
		39E9	**40E9**	**41E9**	**40E8**	
	1	Nephrops	Herring	Crabs (C.P.Mixed Sexes)	Lobsters	
	2	Lobsters	Nephrops	Lobsters	Crabs (C.P.Mixed Sexes)	
	3	Crabs (C.P.Mixed Sexes)	Crabs (C.P.Mixed Sexes)	Nephrops	Nephrops	
	4	Monks and Anglers	Lobster	Haddock	Velvet Swim Crab	

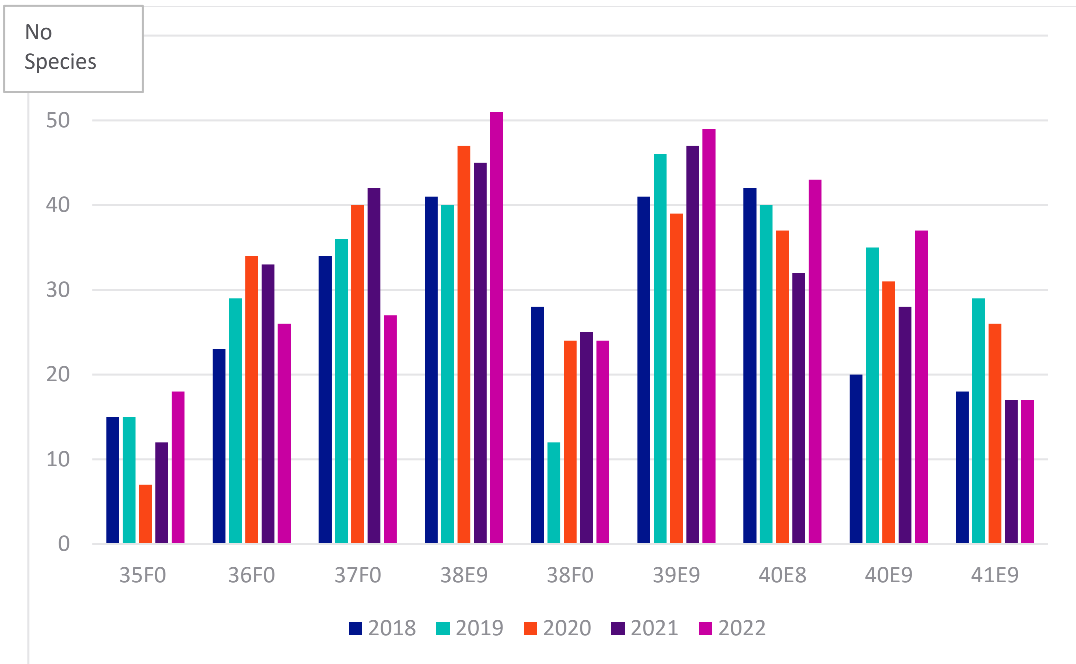
	ICES Rectangles				
	35F0	36F0	37F0	38E9	38F0
5	Halibut	Halibut	Monks and Anglers	Monks and Anglers	

Source: MMO (2023)

29.4.36 It should be noted that there is considerable annual variation between the species and quantities of fish caught in addition to variation by location. Figure 29-7 describes the number of different species caught within each of the ICES rectangles within the Study Area during a five-year period from 2018 to 2022. There has been an increase in the different number of species caught within rectangles 35F0, 38E9, 39E9, 40E8 and 40E9. There has been a fairly gradual increase in different species caught within rectangles 36F0, 37F0 and 41E9, however a drop in 2022 of at least 7 species. 38F0 has had a relatively constant number of species with the exception of a drop in numbers in 2019.

29.4.37 This graph does not demonstrate any specific trend in the number of species being caught but does illustrate the potential for significant variation between year and location.

Figure 29-7: Number of different species caught within the Study Area between 2018 and 2022. Source: MMO (2023)



Temporal Trends

29.4.38 Despite a reduction in vessel numbers over the last decade and reductions in fish quotas for all EU member state fishing fleets, it is considered unlikely that there will be any significant change to fishing effort and activity in the North Sea fishing grounds and in the vicinity of the Projects in the near future.

29.4.39 The majority of the local fishing fleet rely on pots and traps for shellfish and trawling for demersal and pelagic species. As a result, coastal waters have seen an increase in the deployment of static gear to fulfil the market for shellfish.

Restricted Fishing Areas

29.4.40 The Scoping Boundary near the Landfalls intersects or is within proximity of areas which have fishing restrictions. These are either put in place by the regional IFCA or by the MMO. Figure 29-8 (Drawing C01494-EGL3&4-FISH-007) illustrates the areas in which fishing is restricted.

EIFCA Byelaw areas

29.4.41 Byelaw 3 – Molluscan Shellfish methods of Fishing which requires Fishers to request authorisation for a license to fish shellfish in these areas (EIFCA, 2023).

29.4.42 Byelaw XXIV: Humber Estuary Cockles Fishery - provisions of this Byelaw state no person shall take, remove or disturb any cockle unless that person holds a current permit issued by the Committee (EIFCA, 2023a).

29.4.43 Whelk Permit Byelaw 2016 - The byelaw requires whelk fishers to have a permit to fish for whelks and to fish in accordance with flexible permit conditions. Whelk permits are issued annually and expire on the 31st of March each year, regardless of when fishers applied or received a permit (EIFCA, 2023b).

North-Eastern IFCA (NEIFCA) Byelaw areas

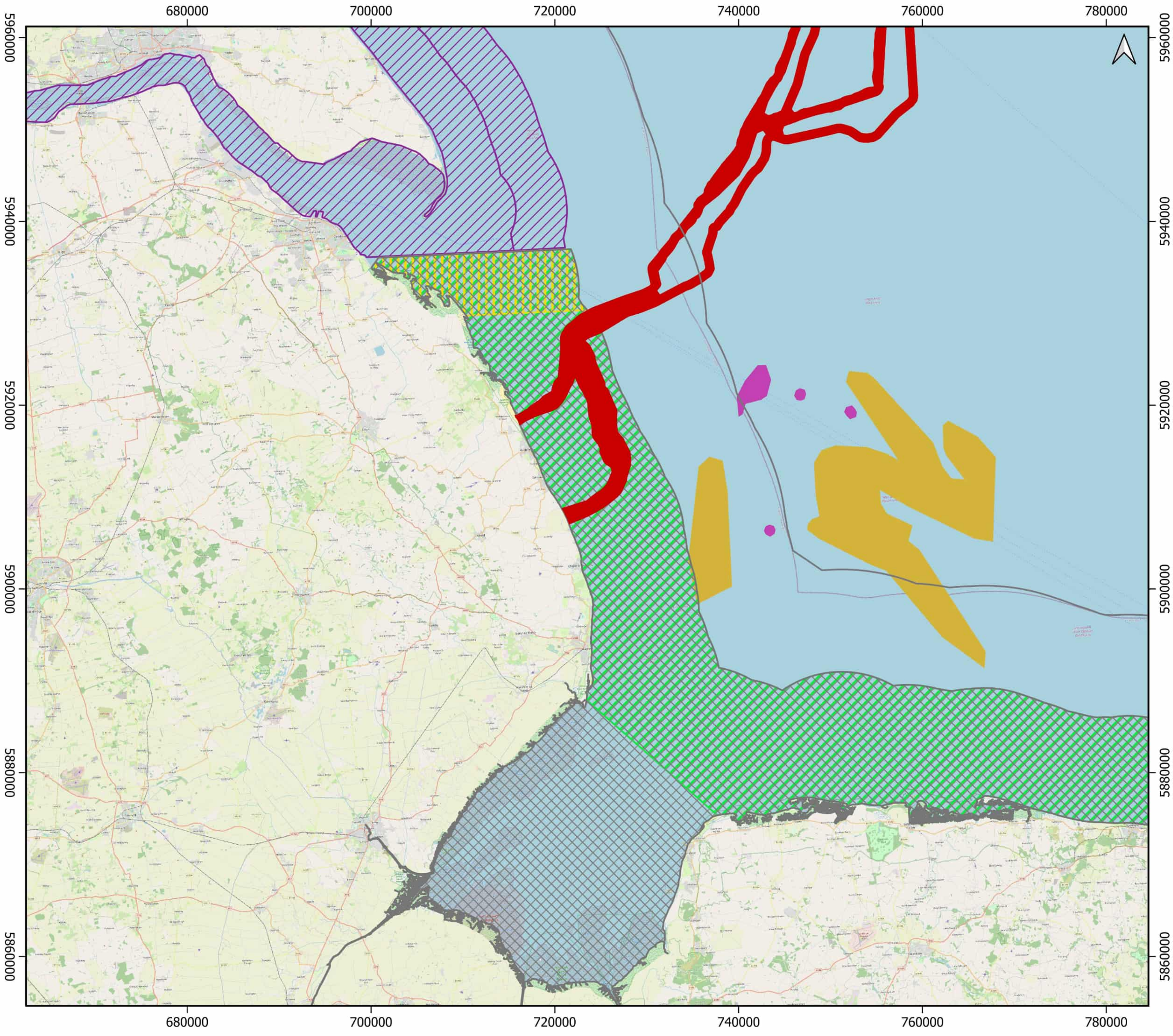
29.4.44 Seine Net, Draw Net or ‘Snurrevaad’: Prohibition of. Byelaw IV - No person shall use in fishing for sea fish any seine net or any draw net of the kind known as the Danish seine or ‘Snurrevaad’. (NEIFCA, 2023)

29.4.45 Permit to Fish for Lobster, Crab, Velvet Crab and Whelk Byelaw XXII - No person shall fish for or take any of the following specified kinds of sea fish: Lobster (*Homarus gammarus*), Crab (*Cancer pagurus*), Velvet Crab (*Necora puber*), or Whelk (*Buccinum undatum*), within the area of the North Eastern Sea Fisheries Committee District except under a specified permit issued by the Committee (NEIFCA, 2023a).

MMO

29.4.46 Inner Dowsing Race Bank and North Ridge SAC 2022 – Towing. Which says that the use of bottom towed fishing gear is prohibited within a specified reef or sandbank area (gov.uk, 2022).

29.4.47 Farne Deeps Fishing Restrictions – Which says vessels deploying demersal trawls and seines (with the exception of beam trawls) are prohibited from fishing in the Farne Deeps. Mesh restrictions apply (Gov.uk, 2023).



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Restricted Fishing Areas within Proximity of the English Landfall

C01494-EGL3&4-FISH-007-B

- 12NM Limit
- Scoping Boundary
- Byelaw 3: Molluscan Shellfish Methods of Fishing
- Byelaw XXIV: Humber Estuary Cockles Fishery
- Whelk Permit Byelaw 2016
- Byelaw 28: Crustacea Conservation

MMO Marine Conservation Byelaws

- Bottom Towed Fishing/ Subtidal Sandbank Communities
- Bottom Towed Fishing-Static Gear/ Biogenic Reef

0 5 10 NM

0 10 20 KM

Date	10/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:400,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 10/07/2024

29.5 Proposed Assessment Methodology

29.5.1 The commercial fisheries EIA will follow the assessment approach set out in Chapter 21 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach.

29.5.2 The commercial fisheries chapter of the EIA will be prepared in accordance with the following guidance:

- Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (FLOWW, 2014)
- Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015)
- Changes to fishing practices around the UK as a result of the development of offshore windfarms (Gray et al. 2016)

29.5.3 Interviews with local and regional fisheries stakeholders will be conducted to establish the baseline and obtain information on fisheries such as fishing vessels operating in the area, types and sizes of vessels, fishing gear(s) used, fishing effort, target species, seasonality in effort or species abundance, and location of key grounds. The interviews will be supplemented by a desk-based review of catch and effort statistics. AIS data from UK and European fishing vessels over 15 m in length and VMS data from registered commercial fishing vessels over 12 m in length will also be obtained and interrogated to assess the distribution of fishing effort. Information will also be sought from the MMO.

29.5.4 In addition, the impact assessment on inter-related topics such as marine physical processes, fish and shellfish, water and sediment quality and shipping and navigation will be used to inform the conclusions in the commercial fisheries chapter. The potential for displacement as a result of cumulative impacts will be considered carefully and an AA approach agreed with key stakeholders once the number of other projects to be assessed is defined.

29.5.5 Where significant impacts are identified, consultation will be undertaken with local and regional fisheries stakeholders to agree proportionate and effective mitigation, and any residual effects will be presented.

29.6 Scope of Assessment

29.6.1 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 29-8 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage the impact has been scoped ‘in’ to the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped ‘out’ of the EIA.

29.6.2 The following potential impacts although applicable to commercial fisheries have been considered In Chapter 28 Shipping and Navigation:

- A vessel engaged in fishing activity snags gear on the cable
- Reduction in under-keel clearance
- Interference with Marine Navigational Equipment

Table 29-8: Scoping assessment of impacts on commercial fisheries

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	Operation (including repair and maintenance)	Decommissioning
Temporary restricted access to fishing ground (including required static gear clearance)	Presence of project vessels and equipment	Commercial fisheries	**IN** - The implementation of advisory clearance distances around construction vessels and safety zones during construction works may result in temporary loss or restricted access to fishing grounds within the Projects. The fishing industry will be consulted on the proposed construction programme and efforts made to ensure co-existence is feasible. Notices to Mariners will be issued in advance of the works.	**IN** - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works or remedial external cable protection may be required. In this case there would be advisory clearance zones put in place. The fishing industry would be advised in advance and efforts made to ensure co-existence. Notices to Mariners will be issued in advance of the works.	**IN** – At the point of decommissioning projects' vessels and equipment would be required in which case the advisory clearance distances would be implemented. The fishing industry would be advised in advance and efforts made to ensure co-existence. Notices to Mariners will be issued in advance of the works.
Temporary displacement of fishing activity into other areas	Presence of project vessels and equipment	Commercial fisheries	**IN** - Fishing activity may be temporarily displaced to other areas due to loss of or restricted access to fishing grounds as a result of the presence of Projects' vessels and safety zones. Established steaming routes may also be disrupted increasing transit times to fishing areas. Although displacement will be temporary, due to the high level of construction activity in the North Sea there is the potential for cumulative impacts with other projects.	**IN** - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during installation.	**IN** – The significance of the effect during decommissioning is similar or of lower magnitude than installation.
Loss of grounds	Deposit of external cable protection	Bottom drift netting	N/A	**IN** – The deposit of external cable protection will cause a localised change in seabed topography. Bottom drift nets are reliant on a flat featureless seabed to operate effectively. The placement of external cable protection would therefore exclude the gear type from being used in that area. As of yet the final route design has not been developed but measures to mitigate potential impacts of avoiding areas of high drift net use through consultation with the local fishers. It is possible that a significant impact may occur and this will be covered by the EIA.	N/A
Changes in distribution of target species	Pre-sweeping of sandwaves Cable burial / trenching	Commercial fisheries	**IN** - Distributions of fish and shellfish populations have the potential to be affected by the activities during installation. If the fish and shellfish EIA concludes that the impacts on fish and shellfish are significant there is the potential that this could directly affect commercial fisheries. This assessment will include consideration of other impacts such as changes in underwater noise, seabed disturbance during sensitive periods for species with demersal life cycles and permanent changes in seabed habitat.		

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification Construction	 Operation (including repair and maintenance)	 Decommissioning
	Installation of cable protection				
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*	Pre-sweeping of sand waves Cable burial and trenching Deposit of external cable protection	Cockles	**IN** - Seabed levelling i.e., during cable routeing, and certain construction activities such as cable trenching, has the potential to lead to localised and temporary increases in suspended sediments. The level and area of impact depend on a number of factors including localised hydrodynamics, source activity and seabed substrate. It has been estimated that the extent of potential effects arising from an increase in suspended sediment will be a maximum of 15 km due to tidal excursion. Increases in suspended sediment will be temporary but have the potential to lead to smothering of sensitive receptors e.g., commercial shellfish beds. Given the proximity of the Projects to sensitive shellfish waters the potential for significant impacts cannot be ruled out at this stage. Any potential for re-suspension of contaminated sediment to reach sensitive habitats will be investigated and will be informed by studies undertaken to inform the marine physical processes chapter of the EIA.	**OUT -** If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works may be required. In these circumstances the significance of the effect will be of lower magnitude than during installation and has therefore been scoped out of the assessment.	**OUT -** The significance of the effect during decommissioning is similar or of lower magnitude than installation and has therefore been scoped out of the assessment.

29.7 References

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30. Other Marine Users

30. Other Marine Users

30.1 Study Area Definition

30.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation and maintenance, and decommissioning of the Projects on other marine users. This chapter considers the following marine users:

- Offshore wind farms (OWF);
- Other power and telecommunication cables;
- Carbon Capture and Storage (CCS) and natural gas storage sites;
- Disposal sites;
- Aggregate extraction sites;
- Chemical weapon and munitions disposal sites;
- Ministry of Defence (MoD) Practice Exercise Areas (PEXA);
- Oil and gas operations;
- Recreational activities (note that recreational boating is also covered in Chapter 28 - Shipping and Navigation); and
- Angling – including chartered anglers (note that commercial fishing is also covered in Chapter 29 - Commercial Fisheries).

30.1.2 The Study Area for this receptor includes the Scoping Boundary plus an additional 15 km buffer to either side. This is a precautionary maximum zone of influence that encompasses the potential impact pathways from increased suspended sediment concentrations. It will be reviewed and refined for the EIA based on maximum tidal excursions and if appropriate sediment dispersion modelling. The zone of influence will be determined by the conclusions of Part 3, Chapter 23 – Marine Physical Processes, and this chapter should be read in conjunction with these findings.

30.2 Data Sources

30.2.1 Data sourced for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the EIA are described in the following sub-sections.

Site-specific Survey Data

30.2.2 Extensive information is available regarding other marine users of the North Sea. Following a detailed review to inform the scope of the data and assessment as presented, no site-specific surveys are planned for this topic.

Publicly Available Data

30.2.3 Desk based review of publicly available data sources (literature and GIS mapping files) will be used to describe the baseline environment. Table 30-1 lists the key data sources which will be used in the assessment.

Table 30-1: Key publicly available data sources for other marine users

Data Source	Description
The Crown Estate (TCE)	OWF lease agreement areas, Marine Aggregate sites, Carbon Capture and Storage sites, Natural Gas Storage sites (The Crown Estate, 2023)
MMO	Data sources for licensed aggregate and disposal sites and OWFs.
KIS-ORCA	KIS-ORCA data is available free of charge to skippers and includes Northern European cables and UK renewable energy structures (KIS-ORCA, 2024)
North Sea Transition Authority (NSTA), Department for Energy Security and Net Zero (DESNZ), Offshore Petroleum Regulator for Environment and Decommissioning	Hosts data on current and historical oil and gas infrastructure (Oil & Gas Interactive, 2023)
EMODnet (2023)	EMODnet is a consortium of organisations assembling European marine data, data products and metadata from diverse sources in a uniform way. In this chapter human activities data will be used such as aggregates, disposal, and offshore windfarm sites.
European Subsea Cable Association (ESCA)	Information for developers on offshore renewable and submarine cable infrastructure (ESCA, 2023).
RYA	UK Coastal Atlas of Recreational Boating (RYA, 2019)

Additional Studies

30.2.4 No additional studies are proposed to be undertaken for this topic.

30.3 Consultation

30.3.1 The scope of the Other Marine Users chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. No comments were received that related directly to this chapter.

30.3.2 Further consultation to inform the PEIR will be undertaken with other marine users to supplement the desk-top review and studies. The following bodies will be consulted, as a minimum, to ensure that the most up-to-date information is collated:

- MMO
- Environment Agency
- The Crown Estate
- MoD
- OPRED
- NSTA Offshore
- Energies UK (OEUK)
- British Marine Aggregate Producers Association (BMAPA)
- RYA
- OWF owners
- Third-party asset owners (e.g., pipelines, power and telecommunication cables) which the Marine Scheme crosses
- Natural England

30.4 Baseline Characterisation

Introduction

30.4.1 The baseline characterisation sections include information on: OWFs, power and telecommunication cables, CCS and natural gas storage sites, dredge and spoil disposal sites, aggregate extraction sites, chemical weapon and munitions disposal sites, PEXAs, oil and gas operations and recreational activities.

Environmental Baseline

Offshore Wind Farms

30.4.2 At the time of writing, five operational or planned OWF have been identified in proximity of the Projects as shown in Figure 30-1 (Drawing C01494-EGL3&4-INFR-001). Table 30-2 summarises the distance from the Scoping Boundary to the OWFs within the Study Area.

Table 30-2: Distance from Scoping Boundary to existing or planned OWFs within the Study Area

OWF	Operator	Status	Distance from the Scoping Boundary*	Projects could cross OWF export cables
Triton Knoll Offshore Wind Farm	Triton Knoll Offshore Wind Farm Ltd, owner J-POWER/Electric Power Development	Fully operational 2022	7.6 km	Yes (see table below)

OWF	Operator	Status	Distance from the Scoping Boundary*	Projects could cross OWF export cables
	Co. LTD, Kansai Electric Power Co., Inc			
Lincs Offshore Wind Farm	Ørsted A/S, Equitix Ltd, Octopus Energy Generation & Corio Generation	Fully operational 2010	6.5 km	No
Inner Dowsing Offshore Wind Farm	BlackRock Investment Management (UK) Limited & Equitix Ltd	Fully operational 2009	8.2 km	No
Lynn Offshore Wind Farm	BlackRock Investment Management (UK) Limited & Equitix Ltd	Fully operational 2009	14.8 km	No
Outer Dowsing Offshore Wind Farm	TotalEnergies SE, Corio Generation, Ontario Teachers' Pension Plan	Application accepted by The Planning Inspectorate in April 2024	13.9 km	Yes (see table below)

*This is the nearest distance to the combined scoping boundary.

Power and Telecommunications Cables

30.4.3 At the time of writing two operational interconnectors, three planned interconnectors, three planned reinforcement power cable projects, seven active telecommunication cables, six operational OWF export cables from Hornsea Projects 1 & 2 OWFs and three potential sets of export cables for planned OWF projects which have been identified within the Study Area. These cables are listed in Table 30-3 and are illustrated in Figure 30-1 (Drawing C01494-EGL3&4-INFR-001).

Table 30-3: Distance from Scoping Boundary to existing or planned power or telecommunication cables within the Study Area

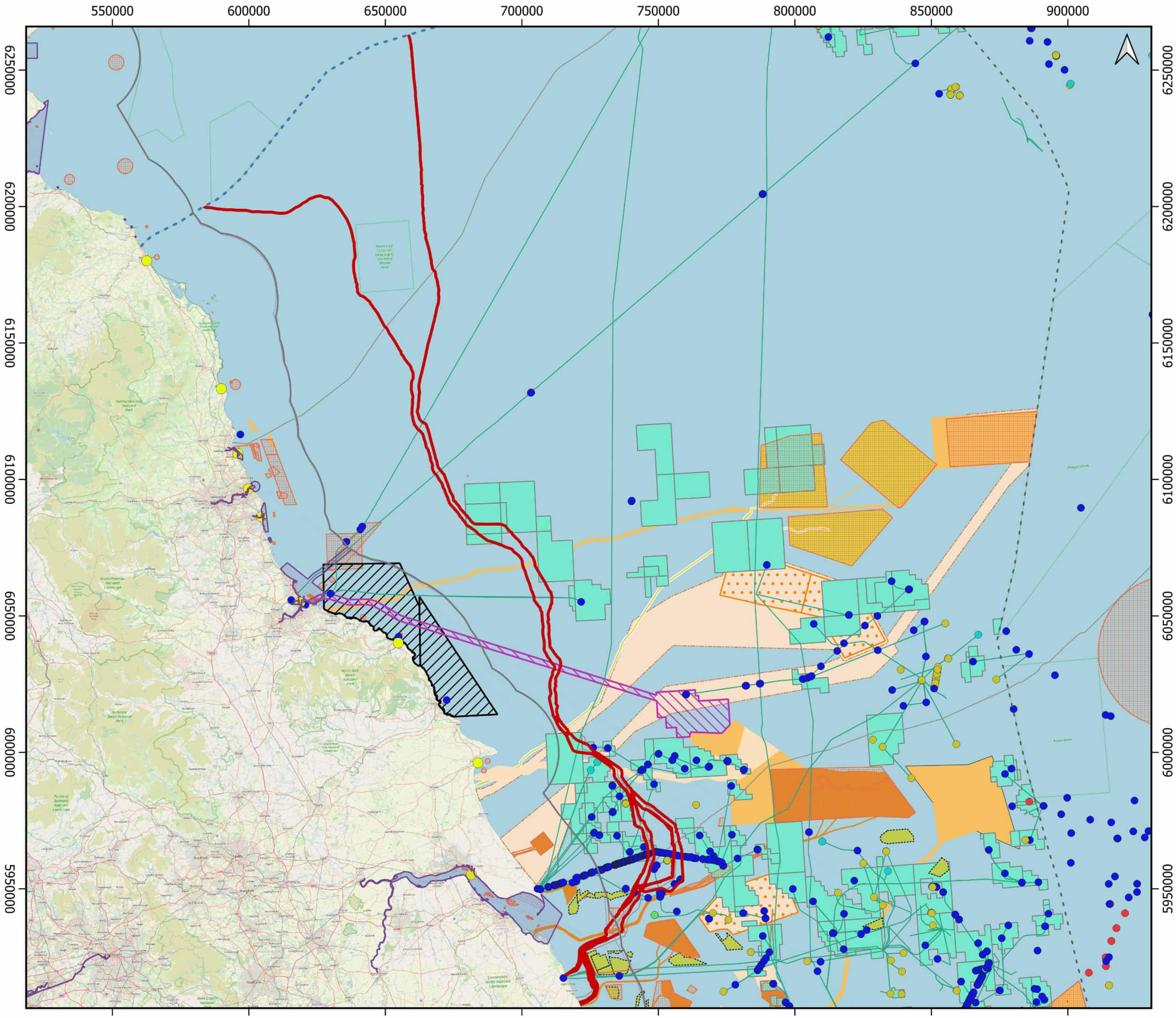
Cable Name and Developer	Type	Project information	Distance from the Scoping Boundary*
Viking Link – Energinet DK and National Grid	Interconnector	Operational	Crosses
North Sea Link	Interconnector	Operational	Crosses
Scotland England Green Link 1 [National Grid and Scottish	Reinforcement power cable	Application submitted to Marine Management Organisation (MMO) 2022	Potentially crosses

Cable Name and Developer	Type	Project information	Distance from the Scoping Boundary*
Power Energy Networks]		Marine Scotland Licence granted July 2023 Construction between 2023 and 2027. MS Application Ref:00009880	
Scotland England Green Link 2 [National Grid and Scottish and Southern Electricity Networks]	Reinforcement power cable	Application submitted to MMO 2022. Marine Scotland Licence granted July 2023. Construction due to start Autumn 2024 to 2029. MS Application Ref: 00009943	Potentially crosses
Nu-Link / SENECA [Nu-Link Consortium – Frontier Power]	Interconnector	Connection agreement at Mablethorpe Substation. Connection between UK and Netherlands (Offshore Energy, 2023). OFGEM licence granted 2023	Potentially crosses
Aminth [Copenhagen Infrastructure Partners]	Interconnector	Landfall at Mablethorpe. Connection between UK and Denmark. The project is expected to reach a final investment decision in 2026 and the start of operations between 2030 and 2032 (Offshore Energy, 2023a). OFGEM licence granted 2023	Potentially crosses
Continental Link Multi-Purpose Interconnector [National Grid Ventures]	Interconnector	Pre-Application Application is expected to be submitted Q2 2025 Connection between UK and Norway.	Potentially crosses
Lynn and Inner Dowsing Offshore Wind Farm export cables [GLID Wind Farms]	Six export cables	Fully operational	8.5 km
Lincs Offshore Wind Farm export cable [Ørsted]	One export cable	Fully operational	6.6 km
Triton Knoll	Two export cables	Fully operational	Partially Crosses

Cable Name and Developer	Type	Project information	Distance from the Scoping Boundary*
[Equitix and TEPCO Power Grid]			
Hornsea Project 1 & 2 Offshore wind farm Export cables [OFTO - Diamond Transmission Partners Hornsea One Ltd, OFTO for Hornsea Project 2 is still at ITT stage]	Five export cables	Fully operational	Crosses
Hornsea Project 4 Offshore Wind Farm cables [Orsted]	Export cables (assumed x3)	Development Consent Order application approved in July 2023	Crosses
Dogger Bank A Offshore Wind Farm Export cables [SSE]	Export cables (assumed x2)	Under construction	Crosses
Dogger Bank B [SSE Renewables, Equinor and Vårgrønn]	Export cables (assumed x2)	Under Construction	Crosses
Dogger Bank C [SSE Renewables, Equinor and Vårgrønn]	Export cables (assumed x3)	Development Consent Order Granted in 2015	Crosses
Sofia [RWE]	Export cables (assumed x2)	Development Consent Order Granted in 2015	Crosses
Outer Dowsing Offshore Windfarm [Green Investment Group and TotalEnergies]	Export cables (assumed x2)	Pre – Application Application is expected to be submitted in Q1 2024	Potentially crosses
Dogger Bank South West [RWE]	Export cables (assumed x2)	Pre – Application Application is expected to be submitted in Q2 2024	Potentially crosses
Dogger Bank South East	Export cables (assumed x2)	Pre – Application	Potentially crosses

Cable Name and Developer	Type	Project information	Distance from the Scoping Boundary*
[RWE]		Application is expected to be submitted in Q2 2024	
Havhingsten [Aquacomms]	Telecom	Active	Crosses
PANGEA NORTH [ASN]	Telecom	Active	Crosses
TATA NORTH EUROPE [EU Networks]	Telecom	Active	Crosses
UK-DENMARK 4 [BT]	Telecom	Active	Crosses
UK-GERMANY 6 [BT]	Telecom	Active	Crosses
NO UK [Altibox]	Telecom	Active	Crosses
CANTAT 3 F4 [Faroese Telecom]	Telecom	Active	Crosses
Breagh Fibre Optic Cable	Fibre	Active	Crosses

* This is the nearest distance to the combined scoping boundary.



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Other Marine Users

C01494-EGL3&4-INFR-001-B

- Exclusive Economic Zone Limit (EEZ)
- 12NM Limit
- Scottish Adjacent Waters
- Scoping Boundary
- Dredging

Oil & Gas Offshore Installation
- Operational
- Under construction
- Closed down
- Decommissioned
- Removed
- Pipeline
- Cable
- UK Port Limit
- Carbon Capture and Storage Site Agreement
- Mining Site Agreement
- Disposal Site
- Aggregate Site Agreement
- NSTA Licensed Block

Offshore Wind
- Active/In Operation
- Under Construction
- Consented
- In Planning
- Pre-planning Application
- Round 4 Preferred Project

0 10 20 NM

0 25 50 KM

Date	11/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,350,000
Created	E Pickard
Reviewed	S Pearce
Authorised	J Drew-Murphy

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Export Date: 11/07/2024

Disposal Sites

30.4.4 At the time of writing thirteen dredge and spoil disposal sites have been identified in proximity of the Projects as shown in Figure 30-1 (Drawing C01494-EGL3&4-INFR-001). Table 30-4 summarises the distance from the Scoping Boundary to these sites.

Table 30-4: Distance from Scoping Boundary to disposal sites within the Study Area

Disposal Site Name	Status	Distance from the Scoping Boundary*
Hornsea 2A, HU209	Closed	Crosses
Hornsea 1, HU205	Open	2.2 km
Spurn Head, HU100	Closed	Crosses
Triton Knoll, HU204	Closed	7.6 km
West of Inner Dowsing Bank, HU200	Not for waste disposal	2.1 km
Sheringham Shoal Drillings, HU123	Closed	6.5 km
North West Zone Area 107, HU149	Closed	13.6 km
Wash Bank, HU114	Closed	8.6 km
Pickerhill Field, HU116	Closed	0.53 km
Adjacent to South Basin Gas, HU115	Closed	Crosses
New Sand Hole, HU070	Closed	12.3 km
Babbage, HU203	Closed	14.8 km
Tyne Burial Site, TY193	Closed	7.3 km

* This is the nearest distance to the combined scoping boundary.
Source: EmodNET (2023)

Aggregate Extraction Sites

30.4.5 At the time of writing eight aggregate extraction sites have been identified in proximity of the Scoping Boundary within the Study Area as shown in Figure 30-1 (Drawing C01494-EGL3&4-INFR-001). Table 30-5 summarises the distance from the Scoping Boundary to these sites.

Table 30-5: Distance from Scoping Boundary to aggregate extraction sites within the Study Area

Site Name and ID	Site owner	Status	Distance from the Scoping Boundary*
Area 197	Tarmac Marine Ltd.	Active	0.9 km

Site Name and ID	Site owner	Status	Distance from the Scoping Boundary*
Area 493	Tarmac Marine Ltd.	Active	0 km**
Area 400	Hanson Aggregates Marine Ltd.	Active	0.8 km
Areas 106/1, 106/2, 106/3	Hanson Aggregates Marine Ltd.	Active	3.5 km
Areas 481/1	Van Oord Ltd.	Active	14.2 km
Areas 514/1, 514/2, 514/3, 514/4	CEMEX UK Marine Ltd.	Active	0.4 km
Area 1805	Hanson Aggregates Marine Ltd.	Exploration	2.3 km
Area 480	Hanson Aggregates Marine Ltd.	Not active	7.5 km
** Although the Scoping Boundary overlaps with Area 493, the route centreline will not enter the marine aggregate site.			

* This is the nearest distance to the combined scoping boundary.
Source: EmodNET (2023)

Chemical Weapons and Munitions disposal sites

30.4.6 There are no chemical weapon or munition disposal sites that lie within the Scoping Boundary. However, UXO munitions are frequently found in the North Sea.

MoD Practice and Exercise Areas (PEXA)

30.4.7 At the time of writing 16 MoD PEXA have been identified within the Study Area (Table 30-6). It is not considered possible for the Projects to avoid all of these.

Table 30-6: MoD PEXA within the Study Area

Name	Category	Information
D613D	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 10000 feet; Maximum Flight Level: 66000 feet
D207: HOLBEACH	Firing danger area, small arms firing range, surface danger area, range	Authority: DIO SD TRG; Maximum Altitude: 23000 0; Activity: B,F,DUO
D307: DONNA NOOK	Surface danger area, firing danger area	Authority: DIO SD TRG; Maximum Altitude: 20000 0; Activity: F,B
D323F	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 25000 feet; Maximum Flight Level: 66000 feet

Name	Category	Information
D323C	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 5000 feet; Maximum Flight Level: 66000 feet
D323D	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 5000 feet; Maximum Flight Level: 66000 feet
X5309: ROWLSTON	Firing danger area, small arms firing range, surface danger area	Authority: ARMY DEPT; Activity: F
D323B	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 5000 feet; Maximum Flight Level: 66000 feet
D323E	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 25000 feet; Maximum Flight Level: 66000 feet
D323A	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 5000 feet; Maximum Flight Level: 66000 feet
D323G	AIAA - Areas of Intense Aerial Activity	Authority: HQ Air; Minimum Flight Level: 25000 feet; Maximum Flight Level: 66000 feet
D412: STAXTON	Surface danger area, firing danger area	Authority: HQ Air; Maximum Altitude: 10000 0; Activity: AAF
D513B: DRURIDGE BAY	Surface danger area, firing danger area	Authority: HQ Air; Maximum Altitude: 23000 0; Activity: F
D513: DRURIDGE BAY	Surface danger area, firing danger area	Authority: HQ Air; Maximum Altitude: 10000 0; Activity: F
D513A: DRURIDGE BAY	Surface danger area, firing danger area	Authority: HQ Air; Maximum Altitude: 23000 0; Activity: F
D513B	Firing danger area	Firing Practice Area

Oil & Gas operations

30.4.8 At the time of writing fifteen active pipelines which cross the Scoping Boundary have been identified, eleven of which are not in use or are abandoned. These pipelines are listed in Table 30-7 and illustrated in Figure 30-1 (Drawing C01494-EGL3&4-INFR-001).

Table 30-6: Oil and Gas pipeline crossings within the Study Area

Name	Type	Status
Amethyst A2D to Easington	Gas	Not in use

Amethyst C1D to Amethyst A1D	Gas	Not in use
Breagh 20IN gas pipeline - Part 1	Gas	Active
Breagh 3IN MEG pipeline - Part 1	Chemical	Active
Cleeton CP to Dimlington	Gas	Active
Cleeton to Minerva umbilical	Hydraulic	Active
Ekofisk 2/4J to Teesside	Oil	Active
Everest to Teesside 36IN gas export	Gas	Active
Helvellyn pipeline	Gas	Active
Langled pipeline	Gas	Active
LOGGS PP to Theddlethorpe gas line	Gas	Not in use
LOGGS PP to Theddlethorpe MEOH line	Chemical	Not in use
Pickerall A to Theddlethorpe	Chemical	Not in use
Minverva to Cleeton PIGGY	Chemical	Active
Minverva to Cleeton gas export	Gas	Active
Neptune to Mercury pipeline	Gas	Active
Neptune to Mercury umbilical	Hydraulic	Active
Nordpipe Olijeledning	Oil	Active
Rose control umbilical	Chemical	Abandoned
Rose pipeline	Gas	Abandoned
Theddlethorpe to Murdoch MD	Gas	Not in use
Theddlethorpe to Murdoch MD MEOH line	Methanol	Not in use
Viking AR to Theddlethorpe gas line	Gas	Not in use
Viking AR to Theddlethorpe MEOH line	Chemical	Not in use
West Sole to Easington 16IN gas line	Gas	Active
West Sole to Easington 24IN gas line	Gas	Active

Source: NSTA (2023)

30.4.9 As well as the pipelines that are in the North Sea, there are several licensed oil and gas blocks which the Scoping Boundary will pass through, listed below:

- 47/10
- 47/9
- 47/5
- 42/27
- 42/22
- 42/17
- 41/5
- 41/4
- 35/29

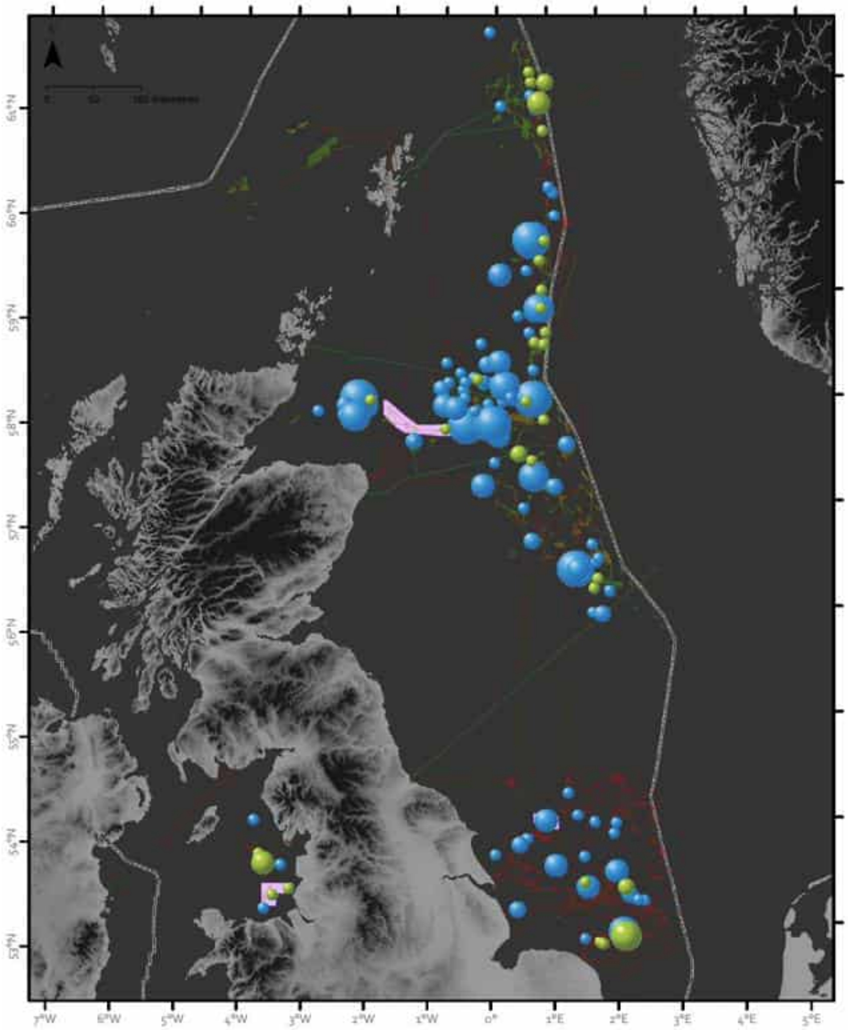
- 47/4
- 47/3
- 42/29
- 42/28
- 42/12
- 42/7
- 42/1
- 41/10
- 35/28
- 35/24
- 35/23

CCS and Natural Gas storage

30.4.10 At the time of writing two CCS projects at the planning stage have been identified within the Study Area. These projects are the Viking CCS project led by Harbour Energy, and Endurance which is a partnership of BP, Eni, National Grid, Shell and Total. The proposed Endurance site is 22.1 km away from the Scoping Boundary and the proposed site pipeline intersects the Scoping Boundary.

30.4.11 The UK Government plans for many more CCS sites to be implemented within the North Sea region. Figure 30-2 from The Crown Estate illustrates the potential CCS sites within the UK.

Figure 30-2: Map of Potential UK Offshore CO_2 Storage Sites. Source: The Crown Estate (2021)



Recreational activities

Bathing waters

30.4.12 There are seven designated ‘bathing waters’ close to the proposed Landfalls in the Study Area which are listed in Table 30-8, all of which were classified as having excellent bathing water status in 2022/23. Consultation with the Environment Agency identified that the entire coastline within the Scoping Boundary between Theddlethorpe and Anderby Creek is considered to be a bathing water.

Table 30-7: Bathing waters within the Study Area

Bathing Water Name	Area	Year of Designation	Status (2022/2023)	Distance from the Scoping Boundary*
Mablethorpe Town	Lincolnshire	1988	Excellent	1.8 km (Theddlethorpe Landfall)
Sutton-on-Sea	Lincolnshire	1988	Excellent	4.1 km (Anderby Creek Landfall)
Moggs Eye	Lincolnshire	1988	Excellent	Within
Anderby	Lincolnshire	1988	Excellent	0.7 km (Anderby Creek Landfall)
Chapel St Leonard’s	Lincolnshire	1988	Excellent	4.7 km (Anderby Creek Landfall)
Ingoldmells South	Lincolnshire	1988	Excellent	8.2 km (Anderby Creek Landfall)
Skegness	Lincolnshire	1990	Excellent	13.7 km (Anderby Creek Landfall)

* This is the nearest distance to the combined scoping boundary.
Source: Gov.UK, 2023

SCUBA Diving

30.4.13 There is evidence that there is recreational SCUBA diving which takes place along the east and northeast coast of England, mainly associated with wrecks but also for marine environmental research (Seasearch, 2023).

Sailing and Cruising

30.4.14 The east and northeast coast of England is a popular area to sail with many RYA sailing clubs along this coastline. The RYA Coastal Atlas (RYA, 2019) identifies the study area as being of low to medium use for recreational sailing.

Water Sports

30.4.15 The east and northeast coast of England have seasonal recreational water sports utilising its coastal waters including surfing, paddleboarding, canoeing, kite surfing, sailboarding, foiling and water skiing.

Angling

30.4.16 There are a number of chartered fishing vessels along the east and northeast coast which run fishing trips during the winter months aiming to catch cod, skate and whiting and in the spring, summer and autumn targeting cod, ling and pollock.

30.5 Proposed Assessment Methodology

30.5.1 The other marine users EIA will follow the assessment approach set out in Part 3, Chapter 21 of this Scoping Report, using the project-wide assessment matrix. The assessment of potential effects will be established using the standard Source-Pathway-Receptor approach. The EIA chapter will be prepared in accordance with the following guidance:

- ESCA Guideline No.6: The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK waters (ESCA, 2016)
- ICPC recommendations (ICPC, 2023)

30.5.2 Crossing/proximity agreements will be established for all cables which are crossed by the Projects cross or which are located within 250 m of the Projects.

30.5.3 The baseline will be established through desk-based review of literature and GIS mapping files and consultation with relevant stakeholders. Where possible quantitative analysis will be provided e.g., an estimate of the amount of area that is no longer available for other projects, including where positioning of the Projects may restrict future development or use. If quantitative analysis is not possible, qualitative assessment will be undertaken based on consultation with relevant stakeholders and review of publicly available literature.

30.5.4 The potential for displacement as a result of cumulative impacts will be considered carefully and an AA approach agreed with key stakeholders once the number of other projects to be assessed is defined. Further detail on the approach to the assessment of cumulative effects is provided in Part 3, Chapter 21.

30.5.5 Where significant effects are identified, mitigation measures will be proposed, and residual effects presented.

30.6 Scope of Assessment

30.6.1 A range of potential impacts on other marine users have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Projects. Table 30-9 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the EIA. A precautionary approach has been taken and where there is no strong evidence base, or the significance is uncertain at this stage the impact has been scoped ‘in’ to the EIA. Where there is a clear evidence base that the effect from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped ‘out’ of the EIA.

30.6.2 It is recognised that the other marine users will be transiting between their licensed areas and ports. However, potential impacts on vessel movements have been assessed in Part 3, Chapter 28 - Shipping and Navigation.

Table 30-8: Scoping assessment of impacts on other marine users

Potential Impacts	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**Operation (including repair and maintenance)**	**Decommissioning**
Interaction with other seabed infrastructure	Boulder clearance, PLGR, pre-sweeping of sand waves. Cable burial and trenching. Anchoring / jack-up legs.	Cables and pipelines	**OUT** - Pre-works surveys will be undertaken to locate all existing infrastructure including subsea cables and pipelines. Following analysis of this information appropriate plans will be put in place to avoid or to cross existing subsea cables or pipelines with the use of external cable protection. Individual crossing agreements will be set up with cable and pipeline owners following guidance from the International Cable Protection Committee (ICPC) and European Subsea Cable Association.	**IN** - If the cable is installed correctly the likelihood of it requiring maintenance and repair is significantly reduced. However, there remains the potential that localised repair works, or remedial external cable protection may be required which potentially could affect any new or existing infrastructure. If this occurs discussions will take place with the cable owners ahead of works taking place and will be agreed through the crossing agreements.	**OUT** – At the point of decommissioning studies will be undertaken to decide how or if the cable will be removed from the seabed and how that will affect any other seabed infrastructure.
Occupancy of seabed – Below seabed	Presence of cables	Oil and Gas, aggregates, power and telecom cables, Offshore wind farms and CCS.	n/a	**IN** - The presence of the cables in the seabed may disrupt the placement of future infrastructure/ offshore activities	n/a
Occupancy of seabed – on seabed	External cable protection	Oil and Gas, aggregates, power and telecom cables, Offshore wind farms and CCS.	n/a	**IN** - The presence of external cable protection may disrupt the placement of future infrastructure/ offshore activities.	n/a

30.7 References

30.7.1 EmodNet (2023). Human Activities Interactive Map. Available at: https://www.emodnet-humanactivities.eu/view-data.php

30.7.2 ESCA (2023) European Subsea Cables Association. Available at: https://www.escaeu.org/

30.7.3 ESCA, (2016) The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters. Available at : https://www.escaeu.org/guidelines/

30.7.4 Gov.uk (2023) List of current bathing waters. Available at: https://www.gov.uk/government/publications/bathing-waters-list-of-designated-waters-in-england/list-of-current-bathing-waters

30.7.5 ICPC, (2023) International Cable Protection Committee. Available at: https://www.iscpc.org/publications/recommendations/

30.7.6 KIS-ORCA (2024) Available at : https://kis-orca.org/map/

30.7.7 NSTA (2023) Offshore Oil and Gas Activity Interactive map. Available at: https://www.arcgis.com/apps/webappviewer/index.html?id=f4b1ea5802944a55aa4a9df0184205a5

30.7.8 Oil and Gas Interactive (2023). Available at: https://w3.abdn.ac.uk/clsm/OandGInteractive

30.7.9 RYA (2019) UK Coastal Atlas of Recreational Boating. Available at: https://www.rya.org.uk/knowledge/planninglicensing/uk-coastal-atlas-of-recreational-boating

30.7.10 Seasearch, (2023). Seasearch Data. Available at: https://www.seasearch.org.uk/data

30.7.11 The Crown Estate (2021) CCUS & OFFSHORE WIND OVERLAP STUDY REPORT Study Findings and Recommendations. Available at: https://www.thecrownestate.co.uk/media/3898/ccus-offshore-wind-overlap-study-report.pdf

30.7.12 The Crown Estate (2023). Search our assets. Available at: https://www.thecrownestate.co.uk/en-gb/what-we-do/asset-map

31. Marine Archaeology

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31. Marine Archaeology

31.1 Study Area Definition

31.1.1 This chapter of the Scoping Report describes the potential impacts arising from the construction, operation (including maintenance and repair) and decommissioning of the Projects on offshore archaeology and cultural heritage receptors.

31.1.2 The Study Area for offshore archaeology comprises a 2 km zone measured from the Scoping Boundary Figure 31-1 (Drawing: C01494-EGL3&4-ARCH-001). The onshore section of the Study Area extends for 200 m, measured from MHWS. This Study Area is considered suitable for characterising the offshore archaeological resource of the Projects, as it will examine assets potentially susceptible to direct and/or indirect impacts. Should further information demonstrate a potential for impacts to offshore heritage assets beyond this Study Area, this may be amended in agreement with NGET and key stakeholders.

31.1.3 Offshore archaeological and cultural heritage receptors located within the Study Area for the topic will be considered against the following categories:

- Submerged prehistory: including palaeolandscapes (A past (usually prehistoric) landscape), palaeolandscape forms, palaeoenvironmental (Of or relating to a past (usually prehistoric) environment) remains and prehistoric artefacts and sites;
- Maritime and intertidal archaeology: broadly comprising vessel remains, wreckage/debris, cargo and sites/structures within the offshore area (MHWS); and
- Aviation archaeology: comprising all military and civilian aircraft crash sites and related wreckage.

31.2 Data Sources

Site-specific Survey Data

31.2.1 Primary data will be obtained from geophysical and geotechnical surveys covering the Projects (scope of works described in Part 3, Chapter 23). This will be collected and assessed following best practice professional guidance for marine archaeology including, but not limited to:

- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for Renewable Energy Sector (Gribble & Leather 2011); and
- Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (English Heritage and Bates, R., Dix, J. K., Plets, R. 2013) (document currently under review by MSDS Marine).

Publicly Available Data

Baseline Summary for the Scoping Report

31.2.2 The baseline summary for offshore archaeology was informed by a range of publicly available data sources.

31.2.3 The submerged prehistory baseline was informed by sea level modelling studies and projects mapping onshore and offshore palaeolandscape features (sources referenced in text below). The outputs of these studies included GIS shapefile data, which were reviewed for the baseline assessment.

31.2.4 The baseline of known archaeological and cultural heritage receptors within the Study Area refers to data obtained from the following sources:

- UKHO data: comprising records relating to charted wrecks and other seabed obstructions that are considered navigational hazards;
- Historic England (HE) National Record of the Historic Environment (NRHE) data: World Heritage Sites, Protected Wrecks, Scheduled Monuments, Listed Buildings, Registered Battlefields, Registered Parks and Gardens, Conservation Areas and non-designated heritage asset records for England;
- Canmore data: archaeological and historic environment records for offshore heritage assets near to Scottish waters; and
- Local Historic Environment Record (HER) data: archaeological and historic environment records for onshore and offshore heritage assets in Lincolnshire.

31.2.5 All spatial data utilised in forming the offshore archaeological baseline was converted to and presented in Universal Transverse Mercator (UTM) Zone 30 North projected from a European Terrestrial Reference System (ETRS) 1989 datum.

Sources for the Future Desk-Based Assessment (DBA)

31.2.6 The DBA, as part of the EIA, would include further, detailed examination of the data sources used for the baseline summary. In addition, a range of relevant published academic articles, books and grey literature reports would be reviewed to inform the baseline. Where applicable and accessible, reports relating to the archaeology of nearby offshore developments would also be reviewed during the DBA.

31.2.7 As referenced in Section 31.2.1 above, further primary data would be obtained from geophysical and geotechnical surveys covering the Projects. The data would be subject to archaeological review to provide a full assessment of known and potential offshore heritage receptors. An intertidal walkover survey would be undertaken at the English Landfall options to ground truth previously recorded heritage receptors and to identify any new receptors that may be of relevance to the assessment. The results would be incorporated into a DBA, which would be undertaken using data from the UKHO, national and local authority sources, and other relevant data sources.

31.2.8 The character and potential of submerged prehistoric landscapes and remains would be based on a review of geological mapping of seabed sediments, solid geology and bathymetry from published BGS sources. This would be enhanced by the geoarchaeological review of geotechnical and geophysical datasets gathered for the Projects.

31.2.9 Regarding the assessment of intertidal heritage receptors, whilst some assessment has been provided within this Scoping Report, it is intended that a range of national and local HER datasets and further relevant data (such as Rapid Coastal Zone Assessment Surveys) would be used to inform the EIA in this area. An intertidal walkover survey will also help to identify and characterise any heritage assets within this area.

31.3 Consultation

31.3.1 The scope of the marine archaeology chapter has previously been consulted on through a voluntary non-statutory scoping report which was submitted prior to the change in consenting strategy. Table 31-1 summarises the responses which were received. The chapter has been updated to reflect these responses.

Table 31-1: Summary of responses received during previous consultation

Organisation	Summary of response received	Action
Historic England	The application must be clear which activities associated with construction, operation and maintenance, and decommissioning are being applied for and which will require separate applications.	The EIA will clearly identify which activities are associated with each phase of the Projects.
Historic England	It is advised that an archaeological desk-based assessment is commissioned from an appropriate and experienced marine archaeological contractor working to recognise professional standards, such as those defined by the Chartered Institute for Archaeologists. This is to qualify any material, or features of historic environment interest revealed by geophysical or geotechnical surveys and to create a comprehensive baseline for these licence areas.	The EIA will set out further guidance documents it will follow on the assets of survey data (e.g., the Historic England Deposit Modelling and Archaeology Guidance for Mapping Buried Deposits).
Historic England	It is recommended that any archaeological reports produced as a part of this development are to be recorded via OASIS V (Online Access to the Index of Archaeological Investigations).	Any archaeological reports produced will be recorded via OASIS V.
Historic England	The 'Data sources' section references the UKHO, NRHE and HER for publicly available data. The description of data within the NRHE only covers the designated heritage assets, which are contained within the NHLE. This should also include the description for the undesignated heritage assets held within the NHRE. Furthermore, consideration of the NRHE undesignated	Data sources within the EIA will be clearly defined.

Organisation	Summary of response received	Action
	heritage asset data should be included within any baseline characterisation within the EIA.	
Historic England	The proposed assessment methodology should also consider further guidance relevant to determining the value of maritime, aviation and seabed prehistory. This would be beneficial to the assessment of sensitivity.	Principal guidance documents added to the relevant section of the scoping report. Detailed list will be provided within the EIA.

31.3.2 Further consultation to inform the PEIR will be undertaken with relevant stakeholders, ensuring that key considerations are included in the DBA and any issues can be resolved at an early stage. Stakeholder feedback may also supplement the DBA, providing information that may not be obtainable through the aforementioned data sources. The following bodies will be consulted, as a minimum:

- MMO;
- Historic England; and
- Lincolnshire County Council

31.3.3 Further details and responses from stakeholder consultation will be included in the Marine Archaeology chapter of the EIA.

31.4 Baseline Characterisation

Introduction

31.4.1 The baseline summary for submerged prehistory is based on a preliminary review of geological mapping of seabed sediments and solid geology from published BGS sources, enhanced by the high-level and localised results of regional and national archaeological and geoarchaeological studies.

31.4.2 The baseline of known archaeological and cultural heritage receptors within the Study Area was formed through preliminary review of data obtained from the UKHO and historic environment data archives.

Overview

Submerged prehistory

31.4.3 The North Sea contains prehistoric submarine archaeological remains which date back to almost one million years ago, encompassing the known chronology of hominid activity in the British Isles. The earliest dated remains of hominid activity in Britain, dating to c. 900,000 Before Present (BP), were recovered from the intertidal Site 3 at Happisburgh, Norfolk, c. 100 km southeast from the proposed English Landfalls. Investigation of this site and others in the vicinity place them in a Middle Pleistocene palaeolandscape characterised by grassland, conifer forest, braided river systems and megafauna (Pathways to Ancient Britain, 2023). A range of regional studies, both geologically and archaeologically focussed, have been undertaken over the past 60 years to develop understanding of the palaeogeography and how humans may have interacted with the palaeolandscapes of the North Sea (Historic England, 2023).

31.4.4 These studies have shown that the coastline along the northeast of England has the potential for the presence of as-yet undiscovered in situ prehistoric sites, artefacts and deposits of palaeoenvironmental interest, located within the inundated nearshore and offshore palaeogeography. Palaeolandscape features such as lake deposits, tunnel valleys, palaeochannels, submerged peat and submerged forests have the potential to contain palaeoenvironmental and archaeological remains. A detailed review of geological units identified within the Projects (by site-specific geophysical and geotechnical surveys) and their inherent archaeological and palaeoenvironmental potential would be undertaken to inform the DBA for the EIA.

Maritime and intertidal archaeology

31.4.5 Maritime archaeological sites comprise two broad categories: the remains of vessels that have been lost by stranding, foundering, collision, enemy action and other causes, and those sites that consist of vessel-related material. Vessel-related material can include (but is not limited to): equipment lost overboard or deliberately jettisoned, such as fishing gear, ammunition and anchors; or the only surviving remains of a vessel, such as its cargo or a ballast mound. Shipwrecks on the seabed provide an insight on the types of vessels used in the past, the nature of shipping activity in the wider area and the changing usage of the marine environment through different periods. Such remains are considered more likely to survive in sediments which promote the preservation of wreck sites (e.g., finer grained sediments that are not subject to high levels of mobility).

31.4.6 The Study Area includes numerous records relating to non-designated archaeological and heritage assets in England. No designated heritage assets are recorded within the Study Area.

31.4.7 Non-designated assets comprise of:

- One hundred and thirty-two (132) wreck records (UKHO; Drawing: C01494-EGL3&4-ARCH-002); and
- Fourteen (14) archaeological sites (Lincolnshire HER; Drawing: C01494-EGL3&4-ARCH-003).

31.4.8 In several cases, records from various data sources may correlate with others for the same site or findspot. Any such instances will be highlighted by the DBA and the resultant total sum of heritage and wreck records would be less than indicated above.

Aviation archaeology

31.4.9 Offshore aviation archaeology receptors comprise the remains, or associated remains, of military and civilian aircraft that have been lost at sea. Evidence is divided into three primary time periods, based on major technological advances in aircraft design:

- Pre-1939;
- 1939-1945; and
- Post-1945.

31.4.10 Several records indicate the possible location of aircraft remains within the Study Area:

- One UKHO record; and
- Five NRHE records.

31.4.11 Maritime aircraft crash sites can retain a significant amount of material and, although these can be difficult to identify and remains may be dispersed and/or buried, there is a possibility that aircraft material may be present within the Study Area. Any aircraft remains would be automatically protected under the Protection of Military Remains Act 1986.

Baseline Characterisation

Submerged prehistory

31.4.12 The BRITICE project (Clark *et al*., 2017) mapped a series of sub-glacial tunnel valleys crossing near to the 12 NM limit of English waters. The North Sea Palaeolandscapes Project (University of Birmingham, 2011) utilised geophysical data to reconstruct the Mesolithic palaeolandscape of part of the Southern North Sea, from c. 12 NM from the Lincolnshire/Norfolk coast to Doggerbank. The results placed a southern part of the Study Area in a palaeolandscape characterised by a large valley to the northeast, the slopes of which were crossed by numerous watercourses. Earlier palaeolandscape features were also identified, including a sub-glacial tunnel valley crossing the Study Area. EMODnet data (2023) holds records for submerged peat at Mablethorpe and submerged forests at Trusthorpe, Sutton-on-Sea and Anderby, all within the Study Area.

31.4.13 Prehistoric coastline modelling by Brooks *et al*. (2011) suggests the Study Area up to c. 12 NM in English waters remained sub-aerially exposed until c. 8,000 BP.

31.4.14 Three Lincolnshire HER entries relate to prehistoric findspots in the intertidal zone of the Study Area. These date to the Palaeolithic and Neolithic.

Maritime and intertidal archaeology (up to 12 NM)

31.4.15 No records within the Study Area relate to remains or sites that are subject to statutory protection.

31.4.16 There are 18 wreck sites recorded by the UKHO within the Study Area within 12 NM (Table 31-2). Two are situated off the East Yorkshire coast at Flamborough Head Figure 31-2 (Drawing: C01494-EGL3&4-ARCH-002), with the remaining 16 lying off the Lincolnshire coast Figure 31-3 (Drawing: C01494-EGL3&4-ARCH-003). Seven of these are listed as ‘dead’, with two of these also recorded as ‘foul ground’. The Lincolnshire HER illustrates 14 archaeological sites within the onshore and intertidal zones of the Study Area (Drawing: C01494-EGL3&4-ARCH-003). These records include find spots, structural remains and landscape features. No Lincolnshire HER entries correlate with UKHO records.

Maritime archaeology (beyond 12 NM)

31.4.17 There are currently no records within the Study Area (beyond 12 NM) that are subject to statutory protection as Scheduled Monuments, Protected Wrecks, Historic Marine Protected Areas or under the Protection of Military Remains Act 1986.

31.4.18 One-hundred and fourteen (114) wreck/obstruction sites are recorded by the UKHO within English waters of the Study Area beyond 12 NM (Drawing: C01494-EGL3&4-ARCH-002; **Table 31-2**). Thirty-one (31) of these are recorded as 'foul ground'. Sixty-two (62) are recorded as 'dead', indicating that they have not been detected by repeated surveys. Thirty-one (31) records are recorded as both 'foul ground' and 'dead'. Three (3) further wrecks are recorded as 'lifted'.

31.4.19 No NRHE or HER monument records lay within English waters beyond 12 NM. However, Canmore provides 11 maritime records here, six of which correlate with UKHO records.

Aviation archaeology

31.4.20 One UKHO record relates to an aircraft crash site in English waters, situated within the Study Area beyond 12 NM (**Table 31-2**; UKHO record 9088). UKHO 9088 relates to a United States Air Force F15, ditched at a broad location in 1990, which has not been identified during subsequent surveys. It is recorded as a 'dead' location by the UKHO.

31.4.21 There are three further recorded losses located within the Study Area i.e., aircraft whose loss location has been arbitrarily set, or is only known approximately. There is also the potential for the discovery of previously unknown aircraft-related debris to exist on the seafloor within the Study Area, with a higher potential for material dating to the Second World War.

31.4.22 Lincolnshire has been home to an extensive aviation industry from the early 20th century and was the home of Bomber Command during the Second World War. Numerous airbases situated throughout the county hosted flight training and combat missions to the European mainland.

Table 31-2: UKHO records in English waters.

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
Up to 12 NM						
85316	-	-	Dangerous wreck	53 16.022 N	0 23.589 E	UKHO
8664	LIZZIE CARTER	sailing vessel	Dangerous wreck; dead	53 27.136 N	0 18.696 E	UKHO
91943	Lincolnshire Time and Tide Bell	-	-	53 22.011 N	0 14.992 E	UKHO
8676	RAVONIA (part) (possibly)	steam ship	Dangerous wreck; broken wreckage	53 29.347 N	0 24.507 E	UKHO
8661	HMS CORFIELD	steam ship	Dangerous wreck; area of debris lying entirely within scour	53 26.94 N	0 18.899 E	UKHO
8667	FRYKEN	steam ship	Dangerous wreck	53 27.651 N	0 26.136 E	UKHO
8678	RAVONIA (part)	steam ship	Dangerous wreck	53 29.964 N	0 24.949 E	UKHO
8997	-	-	Non-dangerous wreck; dead	53 23.269 N	0 24.429 E	UKHO
9074	-	-	Non-dangerous wreck; dead; possible small wreck	53 23.036 N	0 20.229 E	UKHO
8637	STAR	sailing vessel	Non-dangerous wreck; dead	53 20.12 N	0 22.696 E	UKHO
9181	-	-	Lifted	53 17.52 N	0 19.296 E	UKHO

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
9094	-	Pipes/ Tubes/ Diffusers	Dead	53 22.079 N	0 15.421 E	UKHO
81776	-	-	In area of pipelines; possibly disturbed seabed	53 22.408 N	0 18.783 E	UKHO
8640	-	-	Dangerous wreck; lifted	53 20.8 N	0 23.1 E	UKHO
8651	-	fishing vessel	Wreck showing any portion of hull or superstructure	53 22.419 N	0 14.897 E	UKHO
94757	-	-	Dangerous wreck	53 16.319 N	0 19.833 E	UKHO
6678	-	-	Dead, foul ground	54 13.13 N	0 12.526 E	UKHO
6681	-	-	Dead, foul ground	54 11.48 N	0 13.91 E	UKHO
Beyond 12 NM						
4491	CHOICE	Trawler	Non-dangerous wreck, intact and upright	55 56.306 N	1 38.026 W	UKHO
4492	-	-	Dead, non-dangerous wreck	55 54.499 N	1 6.602 W	UKHO
4560	-	-	Dead, non-dangerous wreck	55 0.723 N	0 21.688 W	UKHO
4629	RAMESES	Trawler	Dead, non-dangerous wreck	55 54.999 N	0 50.104 W	UKHO
4633	-	Fisherman's Fastener	Dead, foul ground	55 33.41 N	0 41.35 W	UKHO
4636	-	Fisherman's Fastener	Dead, foul ground	55 33.993 N	0 37.85 W	UKHO
4671	-	Fisherman's Fastener	Dead, foul ground	55 14.41 N	0 30.85 W	UKHO
6205	-	-	Non-dangerous wreck, broken	54 48.808 N	0 7.69 W	UKHO
6384	-	-	Non-dangerous wreck, intact	54 56.524 N	0 19.239 W	UKHO
6464	CYNTHIA	Trawler	Dead, non-dangerous wreck	54 0.965 N	0 33.291 E	UKHO
6528	-	Fisherman's Fastener	Dead; foul ground	54 42.209 N	0 4.992 E	UKHO
6230	-	Fisherman's Fastener	Dead; foul ground	54 44.259 N	0 4.892 E	UKHO
6557	-	-	Dead, non-dangerous wreck	54 20.412 N	0 13.426 E	UKHO
6635	-	Possible boulder or debris	Foul ground	54 34.63 N	0 11.413 E	UKHO
6672	-	-	Dead, foul ground	54 13.813 N	0 13.26 E	UKHO
6682	-	-	Dead, foul ground	54 11.363 N	0 14.71 E	UKHO
6683	-	-	Dead, foul ground	54 10.88 N	0 14.993 E	UKHO
6684	-	-	Dead, foul ground	54 9.347 N	0 16.126 E	UKHO
6715	-	Sailing vessel	Non-dangerous wreck	54 27.088 N	0 11.165 E	UKHO
71773	-	-	Non-dangerous wreck, hight degraded	55 11.1 N	0 28.273 W	UKHO
71775	-	-	Non-dangerous wreck, hight degraded	55 10.869 N	0 28.431 W	UKHO
72000	-	-	Non-dangerous wreck, intact and upright	55 25.137 N	0 30.596 W	UKHO

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
73287	-	-	Dead, non-dangerous wreck, intact and upright possibly	55 41.253 N	0 47.842 W	UKHO
99507	-	-	Foul ground	55 55.661 N	1 39.002 W	UKHO
8842	VIRGINIAN	trawler	Dangerous wreck	53 40.855 N	0 48.648 E	UKHO
8854	SCOTIA (possibly)	trawler	Dangerous wreck	53 38.639 N	0 43.601 E	UKHO
8915	PILSUDSKI	liner	Dangerous wreck	53 46.265 N	0 45.554 E	UKHO
8874	-	sailing vessel	Dangerous wreck	53 41.281 N	0 49.596 E	UKHO
87269	-	-	Dangerous wreck	53 38.897 N	0 43.92 E	UKHO
9045	RADO (possibly)	trawler	Dangerous wreck	53 41.45 N	0 39.575 E	UKHO
8860	CATFORD	steam ship	Dangerous wreck; upright; very broken up; superstructure midships	53 38.948 N	0 41.154 E	UKHO
86593	-	-	-	53 39.655 N	0 54.364 E	UKHO
6717	-	-	Pile of fishing gear (nets & ropes)	54 24.162 N	0 15.637 E	UKHO
9041	-	trawler	Dangerous wreck; poorly defined	53 41.934 N	0 54.923 E	UKHO
9040	-	steam ship	Dangerous wreck; intact	53 41.968 N	0 54.639 E	UKHO
9043	-	-	Foul ground; debris & wreck fragment	53 43.201 N	0 51.074 E	UKHO
9044	VEREINGTE (possibly)	steam ship	Dangerous wreck; bow & boiler intact; stern broken up	53 45.917 N	0 43.441 E	UKHO
6385	-	-	Non-dangerous wreck; intact	54 56.74 N	0 15.306 W	UKHO
8726	SCHIELAND (possibly)	steam ship	Dangerous wreck; upright; bows detached	53 32.761 N	0 37.162 E	UKHO
9067	-	-	Foul ground; dead; small linear contact	53 37.235 N	0 45.575 E	UKHO
8858	SILVER QUEEN	sailing vessel	Dangerous wreck; dead	53 38.851 N	0 51.723 E	UKHO
93002	-	-	Dangerous wreck	53 39.277 N	0 51.165 E	UKHO
8856	CECIL (possibly)	sailing vessel	Dangerous wreck; almost buried	53 38.216 N	0 39.55 E	UKHO
8868	NORFOLK (possibly)	sailing vessel	Dangerous wreck; in two parts	53 40.329 N	0 51.895 E	UKHO
8879	KEYNES	steam ship	Dangerous wreck	53 42.107 N	0 44.821 E	UKHO
9030	-	trawler	Dangerous wreck; steel hull; single boiler	53 39.064 N	0 40.369 E	UKHO
93000	-	-	Dangerous wreck; suspected remains of wreck; partly buried; degraded	53 40.889 N	0 40.925 E	UKHO
93006	-	-	Dangerous wreck	53 38.108 N	0 54.979 E	UKHO
6524	CONDOR (possibly)	trawler	Non-dangerous wreck; intact	54 34.103 N	0 16.783 E	UKHO
6620	RENATE S	motor vessel	Non-dangerous wreck; dead; see also [6706]	54 40.01 N	0 13.391 E	UKHO
6666	-	-	Non-dangerous wreck; intact; probably on side	54 19.608 N	0 15.745 E	UKHO
6532	JOHNNY BOY (probably)	fishing vessel	Non-dangerous wreck; wooden hull; upright; intact	54 45.434 N	0 10.175 E	UKHO
8730	STYLIANOS CHANDRIS	steam ship	Dangerous wreck; in two parts	53 32.599 N	0 30.838 E	UKHO

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
8918	REBONO (probably)	trawler	Dangerous wreck; well-defined; intact	53 47.834 N	0 54.774 E	UKHO
6597	KIELDRECHT (possibly)	steam ship	Non-dangerous wreck	54 5.281 N	0 27.326 E	UKHO
9105	-	-	Non-dangerous wreck	53 53.883 N	0 42.424 E	UKHO
6603	-	-	Non-dangerous wreck; partly collapsed	54 3.299 N	0 36.591 E	UKHO
6549	-	-	Non-dangerous wreck	54 49.708 N	0 2.259 E	UKHO
8953	ROCHESTER (possibly)	trawler	Non-dangerous wreck	53 53.283 N	0 42.207 E	UKHO
8966	TWO BROTHERS	trawler	Non-dangerous wreck	53 55.416 N	0 37.924 E	UKHO
6488	APHELION	trawler	Non-dangerous wreck; dead; see [6489]	54 6.914 N	0 29.091 E	UKHO
8913	AJAX	trawler	Non-dangerous wreck; dead	53 46.017 N	0 51.89 E	UKHO
4612	-	Fisherman's Fastener	Foul ground; dead	55 28.577 N	0 22.567 W	UKHO
4614	-	Fisherman's Fastener	Foul ground; dead	55 28.793 N	0 23.367 W	UKHO
4613	-	Fisherman's Fastener	Foul ground; dead	55 28.71 N	0 22.967 W	UKHO
4609	-	Fisherman's Fastener	Foul ground; dead	55 27.56 N	0 21.067 W	UKHO
4600	-	Fisherman's Fastener	Foul ground; dead	55 23.927 N	0 25.167 W	UKHO
4619	-	Fisherman's Fastener	Foul ground; dead	55 30.443 N	0 19.933 W	UKHO
4665	-	Fisherman's Fastener	Foul ground; dead	55 19.127 N	0 24.633 W	UKHO
4659	-	Fisherman's Fastener	Foul ground; dead	55 20.543 N	0 25.617 W	UKHO
4662	-	Fisherman's Fastener	Foul ground; dead	55 20.077 N	0 24.55 W	UKHO
4625	-	Fisherman's Fastener	Foul ground; dead	55 35.077 N	0 19.25 W	UKHO
4565	-	Fisherman's Fastener	Foul ground; dead	55 5.877 N	0 20.9 W	UKHO
8940	LISMORE	trawler	Non-dangerous wreck; dead	53 52.316 N	0 42.74 E	UKHO
8968	DEVONIAN	trawler	Non-dangerous wreck; dead	53 56.216 N	0 46.49 E	UKHO
9135	-	-	Non-dangerous wreck; dead	53 45.634 N	0 45.59 E	UKHO
67143	MILO	sailing vessel	Non-dangerous wreck; dead	53 34.418 N	0 31.043 E	UKHO
67164	SECRET	sailing vessel	Non-dangerous wreck; dead	53 34.418 N	0 31.043 E	UKHO
8759	LANCASTER	trawler	Dangerous wreck; dead	53 33.519 N	0 34.294 E	UKHO
8994	LANCASTER (possibly)	trawler	Dangerous wreck; upright; intact	53 32.172 N	0 32.295 E	UKHO
8852	ROYSTON	steam ship	Dangerous wreck; broken midships; deep trawl scours close to E	53 37.534 N	0 39.488 E	UKHO
8995	-	-	Non-dangerous wreck; dead	53 30.485 N	0 31.461 E	UKHO

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
8691	BEELSBY	sailing vessel	Dangerous wreck; dead	53 31.019 N	0 31.394 E	UKHO
6673	-	-	Foul ground; dead	54 13.763 N	0 14.959 E	UKHO
6655	-	-	Foul ground; dead	54 28.578 N	0 13.125 E	UKHO
6652	-	-	Foul ground; dead	54 29.711 N	0 16.475 E	UKHO
6640	-	-	Foul ground; dead	54 32.778 N	0 15.792 E	UKHO
6487	JOSEPH AND WILLIAM	sailing vessel	Non-dangerous wreck; dead	54 6.914 N	0 25.792 E	UKHO
6489	ALBATROSS	trawler	Non-dangerous wreck; dead; see [6488]	54 6.914 N	0 29.091 E	UKHO
73566	HOLMAR I	motor vessel	Non-dangerous wreck	54 18.512 N	0 13.393 E	UKHO
8903	LARCHWOOD (possibly)	steam ship	Dangerous wreck; intact	53 41.718 N	0 54.539 E	UKHO
6516	-	-	Non-dangerous wreck; dead	54 16.513 N	0 16.892 E	UKHO
9159	-	-	Dead; possible boulder	53 34.01 N	0 36.485 E	UKHO
9160	-	-	Dead; possible pile of boulders	53 33.985 N	0 36.993 E	UKHO
8888	-	-	Dead	53 43.817 N	0 47.29 E	UKHO
78151	-	-	Non-dangerous wreck; upright; almost fully buried	54 7.152 N	0 22.165 E	UKHO
9088	**-**	**aircraft**	**Foul ground; dead**	**53 41.018 N**	**0 48.89 E**	**UKHO**
67187	-	-	Non-dangerous wreck; dead	53 43.017 N	0 46.89 E	UKHO
6529	-	Fisherman's Fastener	Foul ground; dead	54 42.759 N	0 9.392 E	UKHO
9091	STRATON (possibly)	trawler	Non-dangerous wreck; dead	53 38.302 N	0 43.359 E	UKHO
67163	SCHIELAND	steam ship	Lifted	53 32.185 N	0 33.726 E	UKHO
81021	-	-	250kg gearbox	53 50.732 N	0 48.383 E	UKHO
9145	SCOTIA (possibly)	-	-	53 37.599 N	0 47.341 E	UKHO
83321	-	-	Cylindrical tank	54 51.105 N	0 2.568 W	UKHO
6536	-	Fisherman's Fastener	Foul ground; dead	54 49.758 N	0 6.392 E	UKHO
6619	RENATE S	fishing vessel	Non-dangerous wreck; dead	54 38.51 N	0 14.191 E	UKHO
6688	-	-	Non-dangerous wreck; intact; upright	54 7.162 N	0 21.855 E	UKHO
6706	RENATE S (possibly)	motor vessel	Non-dangerous wreck; see [6620]	54 40.276 N	0 16.116 E	UKHO
8891	-	steam ship	Dangerous wreck; upright; intact; E end buried	53 44.168 N	0 50.341 E	UKHO
9058	-	-	Dangerous wreck; part of hull only; filled with large stones	53 51.233 N	0 39.891 E	UKHO
71850	-	-	Non-dangerous wreck; collapsed; highly degraded	55 23.97 N	0 22.703 W	UKHO
71848	-	-	Non-dangerous wreck; in two parts; highly degraded	55 32.506 N	0 18.754 W	UKHO
6530	-	-	Foul ground; dead	54 44.259 N	0 4.892 E	UKHO

UKHO ID	Name	Type	Description	Latitude	Longitude	Source
9161	-	-	Dangerous wreck: stern section, partially buried	53 32.494 N	0 37.446 E	UKHO
103434	-	-	Dangerous wreck	53 37.86 N	0 37.86 E	UKHO

31.5 Proposed Assessment Methodology

31.5.1 For this Scoping Report, the baseline of known offshore archaeology and cultural heritage receptors within the Study Area refers to data obtained from the data sources listed above. The data collection has been completed in line with the Chartered Institute for Archaeologists' (CIfA) *Standard and guidance for historic environment desk-based assessment* (CIfA 2020). This information will feed into a full DBA undertaken as part of the EIA.

31.5.2 In addition to the receptors examined for the baseline characterisation of this Scoping Report, the EIA will examine the Historic Seascape Characterisation (HSC) of the Study Area. Any impacts to the HSC will be identified within the DBA.

31.5.3 The ES will be prepared following relevant legislation, policy and guidance for offshore archaeology, including, but not limited to, the following:

- Legislation:

  a) The World Heritage Convention (1972);
  b) Protection of Wrecks Act (1973);
  c) Ancient Monuments and Archaeological Areas Act (1979);
  d) United Nations Convention on the Law of the Sea (1982);
  e) Protection of Military Remains Act (1986);
  f) Merchant Shipping Act (1995);
  g) International Council of Monuments and Sites Charter on the Protection and Management of Underwater Cultural Heritage (1996) (the Sofia Charter);
  h) UNESCO Convention on the Protection of Underwater Cultural Heritage (2001);
  i) European Convention on the Protection of Archaeological Heritage (revised) (1992) (the Valletta Convention) – ratified by the UK Government in 2000 and came into force in 2001;
  j) European Landscape Convention (2000) – adopted in the UK in 2007; and
  k) Marine and Coastal Access Act (2009).

- Policy, Plans, and Supporting Documents:

  a) Marine Policy Statement (MPS) (2011);
  b) East Inshore and East Offshore Marine Plans (2014); and
  c) North East Inshore and Northeast Offshore Marine Plan (2021).

- Key Guidance:

  a) Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA 2020);
  b) Designation Policy and Selection Guidance (DPSG 2019);
  c) Historic Environment Circulars;
  d) Deposit Modelling and Archaeology: Guidance for mapping buried deposits (Historic England, 2020).

e) Key Agencies Group National and Major Developments: An Agency Joint Statement on Pre-application Engagement;
f) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (ICOMOS 2011).
g) Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2008);
h) COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector; (Wessex Archaeology, 2007);
i) Marine Geophysics Data Acquisition, Processing, and Interpretation: Guidance Note (EH, 2013, note MSDS Marine are currently in the process of updating this guidance on behalf of Historic England);
j) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);
k) Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate 2021); and
l) Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate 2014).

31.5.4 To define the scope of the environmental receptors, liaison between key stakeholders and Archaeological Curators may be required. Key consultees are listed in Table 31-1.

Assessment Criteria and Assignment of Significance

31.5.5 Following the identification of marine archaeological receptors within the Study Area, the EIA will attribute a significance of effect to each receptor, in correlation to the project-related activity which results in a direct or indirect impact. The significance of effect will be determined by identifying the sensitivity and magnitude of change for each receptor. These terms and the proposed assessment methodology to be applied are described within this Section.

31.5.6 Both sensitivity and magnitude of change are influenced by the value, or significance, of a receptor as a heritage asset, which will be defined prior to the assessment of impact significance. Assignation of a level of significance will be guided by appropriate industry advice, including Historic England's *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment* (2008), *Managing Significance in Decision-Taking in the Historic Environment* (2015) and *Statements of Heritage Significance: Advice Note 12* (2019).

31.5.7 14.5.1.1. Value

31.5.8 The UK Marine Policy Statement (HM Government, 2011) describes a heritage asset (including archaeological receptors) as holding a degree of significance (value) meriting consideration, where significance relates to the heritage interest of an asset and the value they hold for present and future generations.

31.5.9 Both designated and non-designated heritage assets can hold heritage value. Value considers whether the receptor is rare, has protected status or has importance at a local, regional, national or international level. Designated assets, such as Protected Wreck Sites have been assigned the highest level of value. The value of non-designated heritage assets can be determined through professional interpretation of the values or characteristics of the asset.

England

31.5.10 Historic England's Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (HE, 2008) defines the significance of a heritage asset as “the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it”. HE recommend use of the following valuation criteria to determine heritage significance:

- Evidential value: the potential of an asset to yield evidence about past human activity;
- Historical value: the ways in which past people, events and aspects of life can be connected through an asset to the present, tending to be illustrative or associative;
- Aesthetic value: the ways in which people draw sensory and intellectual stimulation from an asset; and
- Communal value: the meanings of an asset for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values but tend to have additional and specific aspects.

31.5.11 Within the EIA, identified assets will be assigned value alongside the relevant regional guidance documents and terminology (i.e. HE guidance for assets in England). Although the terminology may vary, the similarity of the valuation criteria will result in equivalent attributed levels of significance.

31.5.12 The value of known archaeological assets will also be assessed on a five-point scale, using professional judgement informed by criteria provided in Table 31-3.

Table 31-3: Criteria to assess the heritage value of receptors.

Value	Definition
High	Internationally or nationally important. Within a marine or intertidal context, high value heritage assets can include: • World Heritage Sites and assets of acknowledged international importance or that can greatly contribute to international research objectives; • Sites designated under national legislation, i.e. Scheduled Monuments, Protected Wreck Sites, etc. • Buildings designated under the Planning (Listed Buildings and Conservation Areas) Act 1990 (England) • Additionally, any remains which are not currently designated but have equivalent significance to a designated asset are considered to be of high value.
Medium	Within a marine or intertidal context, medium value assets include: • Heritage assets that are not designated and that do not meet the criteria for designation, but display notable values or characteristics; and • Heritage assets, groups of assets or landscapes that contribute to regional research objectives.
Low	Within a marine or intertidal context, low value assets include: • Heritage assets displaying limited values or characteristics; and

Value	Definition
	• Heritage assets, or groups of assets, that contribute to a limited degree to regional research objectives.
Negligible	Within a marine or intertidal context, negligible value assets include: • Heritage assets with very little or no surviving archaeological interest and little or no heritage value or characteristics; and • Heritage assets or groups of assets that cannot appreciably contribute to regional research objectives.
Uncertain	Assets for which the importance of the resource has not been or cannot be ascertained.

31.5.13 While a designation (e.g., as a Scheduled Monument, Listed Building, etc.) indicates that a receptor has been identified as being of high value, non-designated archaeological assets are not necessarily of lesser value. Non-designated receptors that can be demonstrated to be of equivalent value to designated sites would be of equivalent significance, as included within Table 31-3.

31.5.14 The nature of the marine archaeological resource is such that there is a high level of uncertainty concerning remains on the seabed. Often data regarding the nature and extent of assets are limited or out of date and the precautionary principle will be applied to all aspects of archaeological impact assessment in the EIA.

Sensitivity

31.5.15 The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. Sensitivity is determined by consideration of the value, adaptability, tolerance and recoverability of a receptor. These criteria are determined through professional judgement and relevant experience and are described further below:

- Value: a measure of the receptor’s heritage significance (criteria and specific assessment methodology detailed above);
- Adaptability: the ability of a receptor to adapt to or avoid an external factor;
- Tolerance: the susceptibility (ability to be affected or unaffected) of a receptor to an external factor; and
- Recoverability: the ability of a receptor to return to a state close to that which existed before the activity or event caused change within a specific period of time.

31.5.16 The guidelines presented in Table 31-4 will be adopted in the EIA to define the sensitivity of a receptor.

Table 31-4: Sensitivity levels for receptors

Sensitivity	Description
High	Receptor has very limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.

Medium	Receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Low	Receptor has some tolerance to avoid, adapt to, accommodate or recover from the anticipated impact.
Negligible	Receptor is generally tolerant to and can accommodate or recover from the anticipated impact.

31.5.17 The National Planning Policy Framework (NPPF, 2023) states that heritage assets should be recognised as "an irreplaceable resource" and to "conserve them in a manner appropriate to their significance".

31.5.18 Heritage receptors cannot typically adapt, tolerate or recover from direct impacts resulting in material damage or loss caused by development. Consequently, the sensitivity of each receptor is predominantly quantified only by their value. Where receptors can adapt to, tolerate or recover from indirect impacts, these factors will be incorporated into an assessment of their sensitivity as part of the EIA.

31.5.19 In some instances, the value of a receptor is recognised by means of designation and the 'value' element recognises and gives weight in the assessment to that designation. However, irrespective of the recognised value, all receptors will exhibit a greater or lesser degree of sensitivity to the potential changes brought about by the Projects. The assessment of sensitivity is a matter of judgement applied using professional expertise, based on the receptors and impacts identified within the Study Area.

Magnitude of change

31.5.20 The magnitude of change is defined by the level of alteration to a receptor resulting from project-related impacts, as measured from that receptor's baseline state and condition, alongside environmental factors and natural variability. The assessment of magnitude will consider both positive and negative changes to a receptor.

31.5.21 The criteria to be used in assessed are set out in Table 31-5. Definitions have been established with reference to key documentation, including the MPS (HM Government, 2011).

Table 31-5: Magnitude of change definitions

Magnitude of change	Definition	
	Positive change (beneficial)	Negative change (adverse)
High	• Large scale improvement of asset or attribute quality; and/or • extensive restoration or enhancement.	• Substantial loss or harm to the heritage asset and/or integrity of the heritage asset or severe damage to key characteristics, features or elements, such that the heritage asset is lost or its significance is totally altered; and/or • Permanent/irreplaceable change which is certain to occur.
Medium	• Improvement to, or addition of, key characteristics, features or elements of the resource; and/ or	• Loss of, or alteration to, key characteristics, features or elements; and/or

	• Improvement to attribute quality.	• Measurable change in significance, attributes, quality or vulnerability, such that the heritage asset and its significance is altered.
Low	• Minor improvement to, or addition of, one or a small number of characteristics, features or elements; and/or • Very minor improvement to attribute quality.	• Minor loss of, or small alterations to, one or a small number of characteristics, features or elements; and/or • Noticeable change in attributes, quality or vulnerability.
Negligible	No change or unquantifiable change to the receptor and its significance.	

Significance of impact

31.5.22 The significance of an impact on a heritage receptor, whether a direct or indirect impact, is determined by correlating the sensitivity of the archaeological receptor (Table 31-4) and the magnitude of the change (Table 31-5). The impact will be presented as of major, moderate, minor or negligible significance and can be positive (beneficial) or negative (adverse). The matrix in Table 31-6 provides a guide to the assessment but is not a substitute for professional judgement and interpretation, particularly where the sensitivity or effect magnitude levels are not clear or are borderline between categories.

Table 31-6: Significance of impact matrix

		Magnitude of change			
		High	**Medium**	**Low**	**Negligible**
Value / sensitivity of receptor	**High**	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible

31.5.23 Table 31-7 provides further rationalisation of the implications and definition of each level of impact significance set out in Table 31-7, in relation to historic assets.

Table 31-7: Significance of impact definitions

Significance of impact	**Definition**	
	Beneficial	**Adverse**
Major	Development will deliver a highly positive contribution and/or better reveal the value of a heritage asset of recognised national or international value, such that an application should be treated very favourably.	Substantial harm or total loss of the value of a designated heritage asset (or asset worthy of designation), such that development should not be consented unless substantial public benefit is delivered by the development.

Significance of impact	Definition	
	Beneficial	Adverse
Moderate	Development will deliver a positive contribution and/or better reveal the value of a designated heritage asset (or asset worthy of designation), such that an application should be treated favourably.	Less than substantial harm or total loss of the value of a designated heritage asset or an asset of designable quality, such that the harm should be weighed against the public benefit delivered by the development to determine consent. Harm to a non-designated heritage asset of a greater degree than that perceived of as minor adverse, which should be considered in determining an application.
Minor	Development will deliver a positive contribution and/or better reveal the value of a non-designated heritage asset.	Less than substantial harm to the value of a designated heritage asset, of a lesser degree than that perceived as moderate adverse, but which should still be weighed against the public benefit delivered by the development to determine consent. Harm to a non-designated heritage asset that can be adequately compensated through the implementation of a programme of industry standard mitigation measures.
Negligible	No discernible change to the receptor and its significance.	

Mitigation

31.5.24 Impacts to both known and potential marine archaeological receptors will be addressed through the application of embedded mitigation. In line with current policy and guidance, mitigation aims first to avoid adverse impacts on historic assets, minimise impacts where they cannot be avoided or mitigate impacts where they cannot be minimised.

31.5.25 Known receptors (identified through the assessment) would be avoided through the application of Archaeological Exclusion Zones (AEZs), Temporary Archaeological Exclusion Zones (TAEZs) and subsequent micro-siting of infrastructure on the seabed, as necessary.

31.5.26 Unavoidable impacts to potential receptors would be addressed through a series of agreed mitigation measures to manage discoveries once identified. These measures would be set out in a project-specific Written Scheme of Investigation (WSI), as part of the ES, which would clarify the methodologies to address unavoidable impacts associated with the worst-case scenario (Project Design Envelope), in accordance with the Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects (The Crown Estate, 2021).

31.6 Scope of Assessment

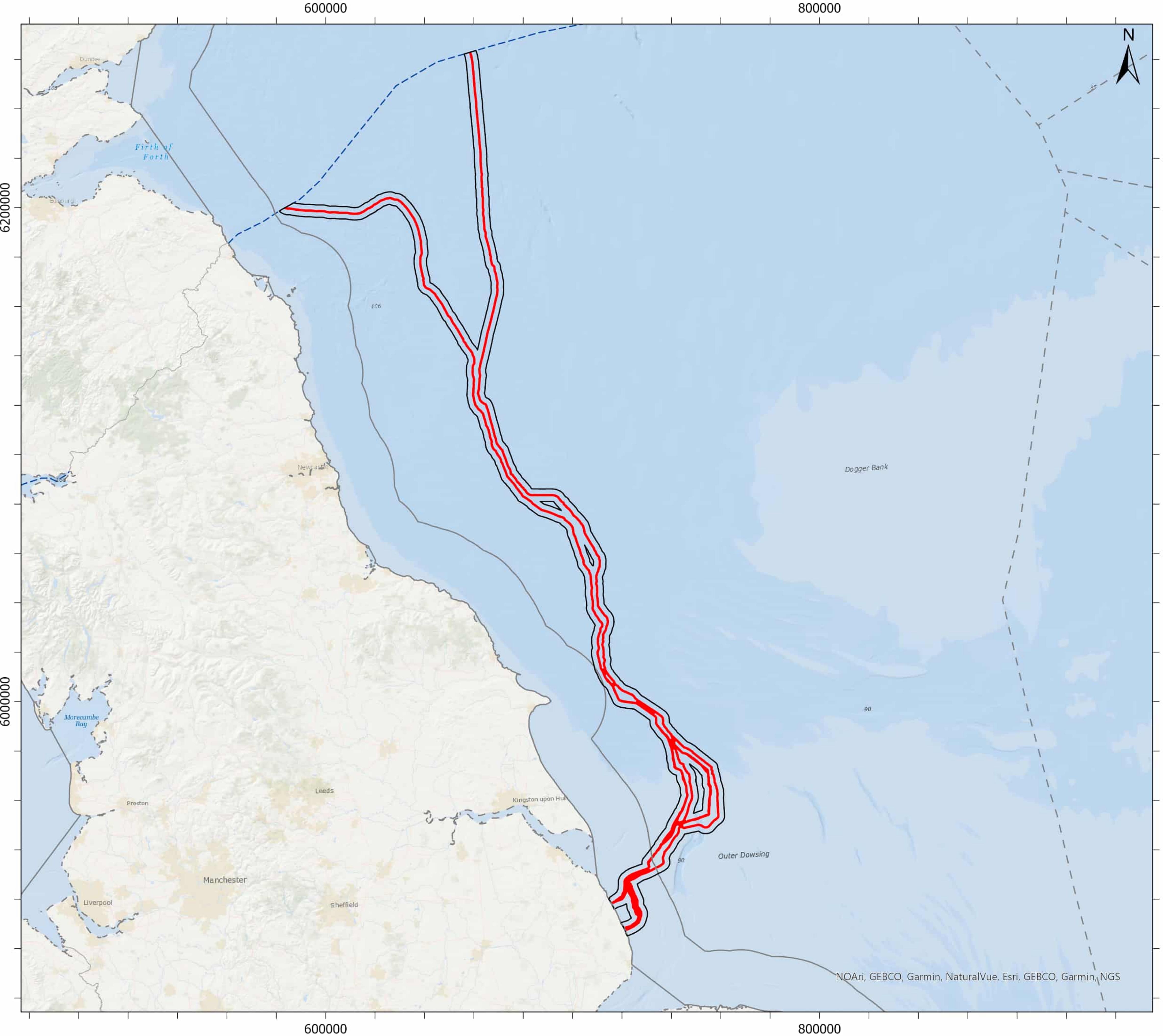
31.6.1 This section describes the potential impacts on offshore archaeological receptors which might potentially occur from the pre-construction, construction, operation and maintenance and decommissioning of the Projects. This assessment considers the methods described within Part 3, Chapter 20 – The English Offshore Scheme. A summary of Projects' phases and the source of potential impacts is summarised in Table 31-8, below.

31.6.2 The potential for and assessment of cumulative effects to marine archaeology receptors arising will be included within the EIA, as outlined in Part 3, Chapter 21 of this Scoping Report.

Table 31-8: Scoping assessment of impacts on Marine Archaeology.

Potential Impact	Project Activities	Sensitive Receptors	Scoping Justification		
			Construction	**O&M**	**Decommissioning**
Direct impacts to marine archaeology assets, resulting in damage and/or loss	Seabed preparation (e.g., boulder clearance, PLGR, pre-sweeping of sand waves, UXO identification and clearance, etc.); Cable burial and trenching; Placement of external cable protection; HDD drive path and entry/exit pits; Anchoring/jack-up foundations; Cable/cable protection repair/replacement; Removal of infrastructure.	Sub-seabed and seabed heritage receptors, including known and potential submerged prehistoric remains and known and potential maritime and aviation assets.	**IN**: Any disturbance of the seabed during preparation and construction activities could directly impact marine archaeology receptors. These effects are likely to be localised, but should they occur, they could lead to adverse and irreversible damage to known or previously undiscovered heritage assets. Where asset locations are already known, embedded mitigation measures will be adopted to avoid and preserve assets, including the application of AEZs and micro-siting.	**IN**: Localised repair/replacement works to cables or remedial external cable protection may be required. Although assets may have been identified prior to or during pre-construction and construction, further assets may remain undetected. Where O&M activities extend beyond the footprint of previous works, undetected assets may experience impacts.	**IN**: The significance of the effect during decommissioning is likely to be similar or of lower magnitude than during the construction phase. However, where decommissioning activities extend beyond the footprint of previous activities, hitherto undetected assets have the potential to experience impacts.
Indirect impacts to marine archaeology assets, resulting in damage, loss, relocation and/or destabilisation	Material deposition; Sediment removal; Scour around installations, anchors.	Sub-seabed and seabed heritage receptors, including known and potential submerged prehistoric remains and known and potential maritime	**IN:** Seabed preparation and construction activities have the potential to destabilise or compress assets, through sediment removal and deposition. Altered hydrodynamic processes may occur around infrastructure and vessel anchors, potentially resulting in the removal of deposits of palaeo-environmental interest and destabilising nearby assets (which	**IN: I**ndirect impacts similar to the construction phase may be experienced by receptors. Unlike direct impacts, the significance of indirect impacts would not likely be lesser in consideration of the footprint of activities.	**IN: I**ndirect impacts similar to the construction phase may be experienced by receptors. Unlike direct impacts, the significance of indirect impacts would not likely be lesser in consideration of the footprint of activities.

Potential Impact	Project Activities	Sensitive Receptors	Scoping Justification Construction	O&M	Decommissioning
		and aviation assets.	may lead to subsequent harm). The EIA will be informed by an assessment on marine physical processes to determine the likely extent, duration and frequency and resultant significance of impact on marine archaeological receptors.		



MSDS Marine

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TRANSMISSION

Marine Archaeology Study Area

C01494-EGL3&4-ARCH-001

- EGL3/4 Scoping Boundary
- Study Area
- 12 NM Limit
- Exclusive Economic Zone (EEZ)
- Scottish Adjacent Waters

0 10 20 Miles

0 25 50 Kilometers

Date	15/07/2024
Coordinate System	ETRS 89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,500,000
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Reviewed	Mark James
Authorised	Julie Drew-Murphy

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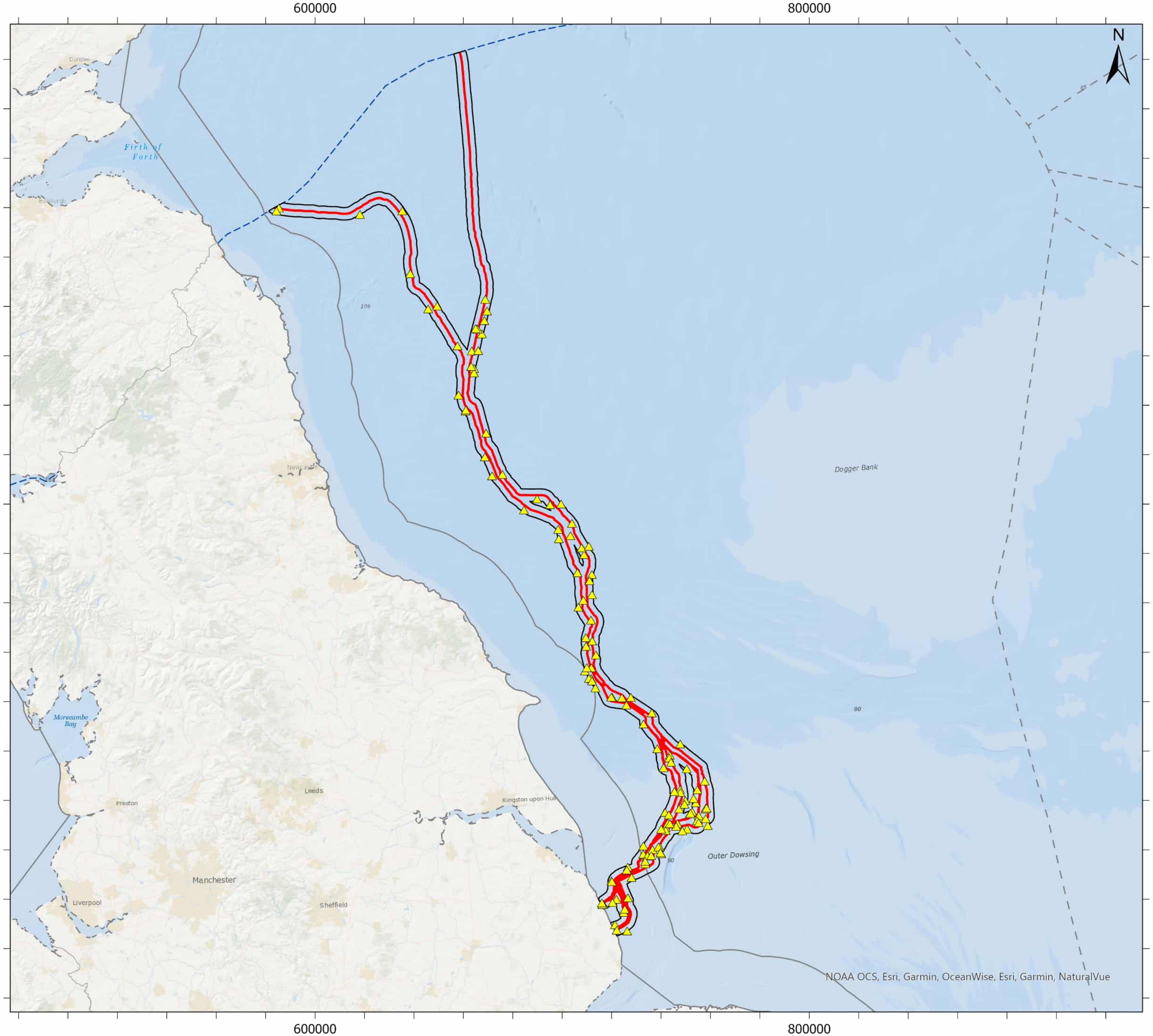

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TRANSMISSION

UKHO Records in Study Area

C01494-EGL3&4-ARCH-002

- EGL3/4 Scoping Boundary
- Study Area
- UKHO record
- 12 NM Limit
- Exclusive Economic Zone (EEZ)
- Scottish Adjacent Waters

0 10 20 Miles

0 25 50 Kilometers

Date	15/07/2024
Coordinate System	ETRS 89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:1,500,000
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Reviewed	Mark James
Authorised	Julie Drew-Murphy

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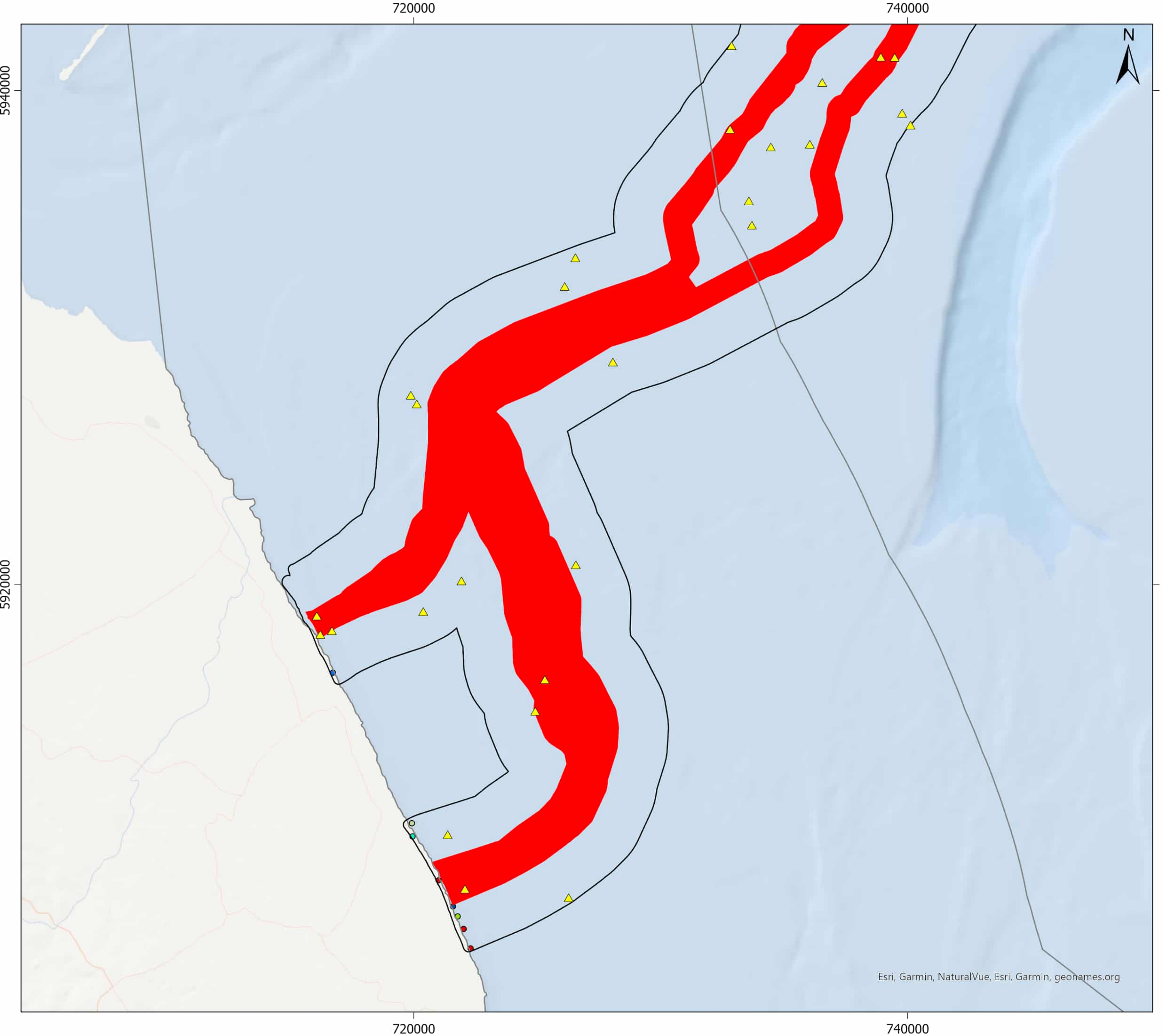

MSDS Marine

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Scottish & Southern Electricity Networks

TRANSMISSION

UKHO and HER records in English waters (to 12 NM)

C01494-EGL3&4-ARCH-003

EGL3/4 Scoping Boundary

Study Area

UKHO record

12 NM Limit

Lincs HER point

Period

Medieval

Modern

Neolithic

Palaeolithic

Post-medieval

Roman

0 2 Miles

0 5 Kilometers

Date	15/07/2024
Coordinate System	ETRS89 / UTM Zone 30N
Projection	Universal Transverse Mercator (UTM)
Unit	Meters
Scale at A3	1:150,000
Created	Tony Brown
Reviewed	Mark James
Authorised	Julie Drew-Murphy

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32. English Offshore Scheme Scoping Conclusions

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32. English Offshore Scheme Scoping Conclusions

32.1.1 Tables 32-1 and 32-2 provide a summary of the impacts of the English Offshore Scheme that have been scoped 'in' to the EIA and those impacts it is proposed to scope out of the assessment, for physical and biological receptors and socio-economic receptors respectively. This has taken into consideration the previous non-statutory scoping response received from the MMO in May 2024.

32.1.2 For certain receptors, the scoping assessment of impacts has been divided by several sensitive receptors. For example, intertidal and subtidal benthic ecology considers intertidal habitats, subtidal broadscale habitats and subtidal Annex I habitats. The scoping conclusion for each sensitive receptor may differ. The tables below identify for each impact where at least one of the receptors has been Scoped IN to the EIA.

Table 32-1 :Summary of the Impacts to be Included with the EIA for the English Offshore Scheme – Physical and Biological Receptors C – Construction, O&M – Operations and Maintenance, D - Decommissioning

Potential Impact	Physical Environment			Intertidal and Subtidal Benthic Ecology			Fish and Shellfish			Intertidal and Marine Ornithology			Marine Mammals and Marine Reptiles		
	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D
Temporary habitat loss/seabed disturbance Disturbance of intertidal and sub-tidal seabed morphology *(Abrasion / disturbance of the substrate on the surface of the seabed* *Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion)*	IN	OUT	IN	IN	IN	IN	IN	IN	IN	-	-	-	IN	IN	IN
Permanent habitat loss *(Physical change (to another seabed type or sediment type)* *Water flow (tidal current) changes including sediment transport considerations)*	IN	OUT	OUT	IN	IN	IN	IN	IN	IN	-	-	-	IN	IN	IN
Temporary increase and deposition of	IN	OUT	OUT	IN	IN	IN	IN	OUT	IN	IN	IN	IN	-	-	-

Potential Impact	Physical Environment			Intertidal and Subtidal Benthic Ecology			Fish and Shellfish			Intertidal and Marine Ornithology			Marine Mammals and Marine Reptiles		
	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D
suspended sediments *(Changes in suspended solids (water clarity)* *Smothering and siltation rate changes* *Hydrocarbon & PAH contamination)*															
Underwater noise changes	-	-	-	OUT	OUT	OUT	OUT	OUT	OUT	-	-	-	IN	IN	IN
Introduction or spread of marine invasive non-native species (MINNS)	-	-	-	IN	IN	IN	OUT	OUT	OUT	-	-	-	-	-	-
Changes in distribution of prey species	-	-	-	-	-	-	-	-	-	IN	IN	OUT	IN	IN	IN
Electromagnetic changes /Barrier to species movement	-	-	-	-	OUT	-	-	IN	-	-	-	-	-	OUT	-
Visual / physical disturbance or displacement	-	-	-	-	-	-	-	-	-	IN	IN	IN	OUT	OUT	OUT
Temperature increase	OUT	OUT	OUT	-	OUT	-	-	IN	-	-	-	-	-	OUT	-
Collision Risk	-	-	-	-	-	-	OUT	OUT	OUT	-	-	-	OUT	OUT	OUT
Accidental spills *(Hydrocarbon & PAH contamination)*	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT
Modifications to tidal and wave regimes and associated impacts to morphological features	IN	IN	OUT	-	-	-	-	-	-	-	-	-	-	-	-
Release of contaminated sediments	IN	IN	IN	-	-	-	-	-	-	-	-	-	-	-	-

Table 32-2: Summary of the Impacts to be Included with the EIA for the English Offshore Scheme – Socio-Economic Receptors C – Construction, O&M – Operations and Maintenance, D - Decommissioning

Potential Impact	Commercial Fisheries			Shipping & Navigation			Other Marine Users			Marine Archaeology		
	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D
Temporary restricted access to fishing ground (including required static gear clearance)	IN	IN	IN	-	-	-	-	-	-	-	-	-
Temporary displacement of fishing activity into other areas	IN	IN	IN	-	-	-	-	-	-	-	-	-
Loss of grounds	-	IN	-	-	-	-	-	-	-	-	-	-
Changes in distribution of target species	IN	IN	IN	-	-	-	-	-	-	-	-	-
Temporary increase and deposition of suspended sediments *(Changes in suspended solids (water clarity) Smothering and siltation rate changes Hydrocarbon & PAH contamination)*	IN	OUT	OUT	-	-	-	-	-	-	-	-	-
Interaction with other seabed infrastructure	-	-	-	-	-	-	OUT	IN	OUT	-	-	-
Occupancy of seabed – Below seabed	-	-	-	-	-	-	-	IN	-	-	-	-
Occupancy of seabed – on seabed	-	-	-	-	-	-	-	IN	-	-	-	-
Direct impacts to marine archaeology assets, resulting in damage and/or loss	-	-	-	-	-	-	-	-	-	IN	IN	IN
Indirect impacts to marine archaeology assets, resulting in damage, loss, relocation and/or destabilisation	-	-	-	-	-	-	-	-	-	IN	IN	IN
Vessel collisions	-	-	-	IN	IN	IN	-	-	-	-	-	-
Impact on human safety due to reduced visibility	-	-	-	IN	IN	IN	-	-	-	-	-	-
Anchor strike/drag	-	-	-	IN	IN	IN	-	-	-	-	-	-
Fishing gear snagging	-	-	-	IN	IN	IN	-	-	-	-	-	-
Displacement of vessels Due to project vessels blocking navigation features. Disturbance to existing shipping patterns	-	-	-	IN	IN	IN	-	-	-	-	-	-

Potential Impact	Commercial Fisheries			Shipping & Navigation			Other Marine Users			Marine Archaeology		
	C	O&M	D	C	O&M	D	C	O&M	D	C	O&M	D
Reduction in under keel clearance	-	-	-	IN	IN	IN	-	-	-	-	-	-
Interference with marine navigational equipment	-	-	-	OUT	IN	OUT	-	-	-	-	-	-

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