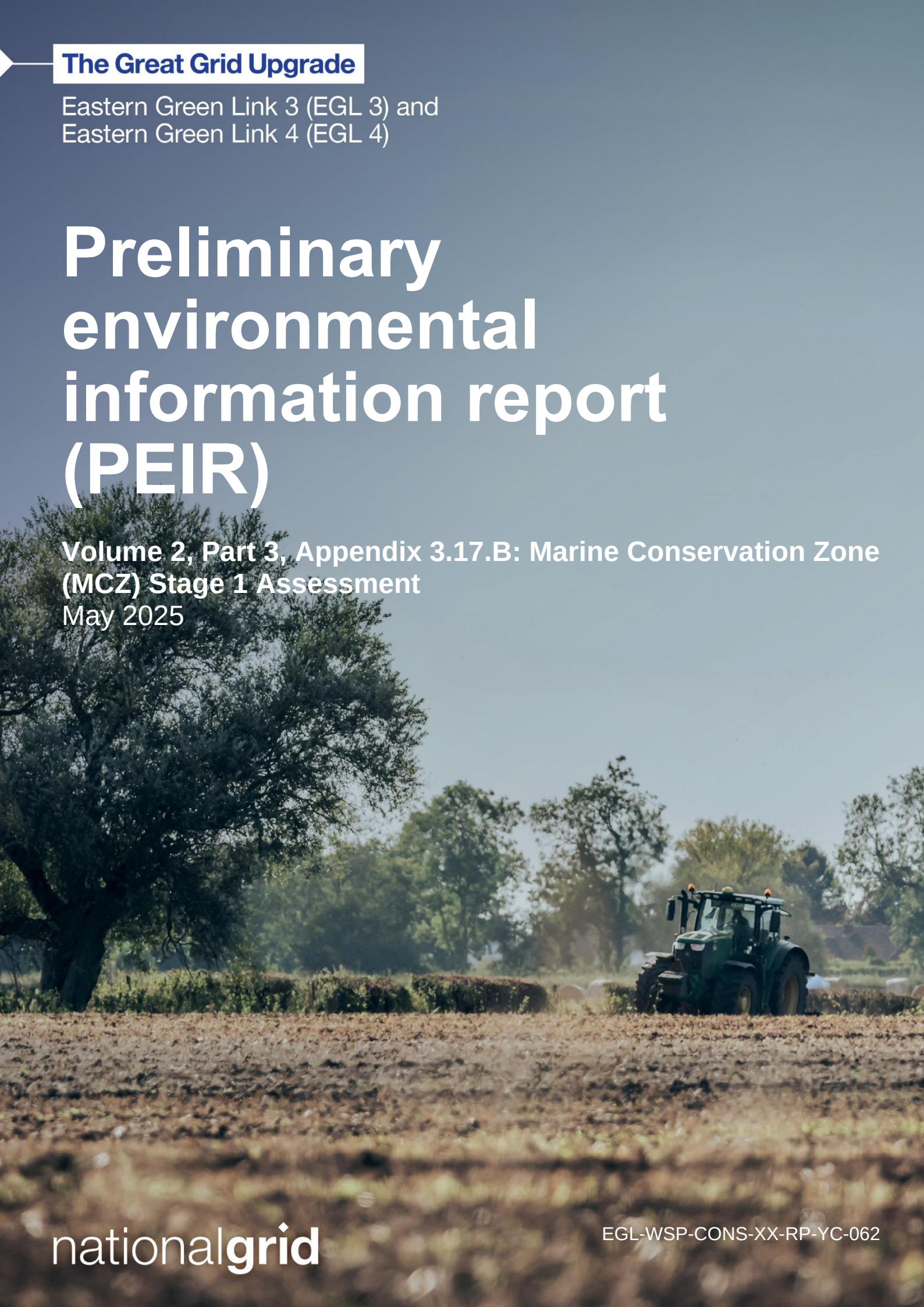
The Great Grid Upgrade

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

Preliminary environmental information report (PEIR)

Volume 2, Part 3, Appendix 3.17.B: Marine Conservation Zone (MCZ) Stage 1 Assessment

May 2025



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Contents

3.17.B Marine Conservation Zone (MCZ) Stage 1 Assessment

3.17.B.1 Project Background

3.17.B.1.1 This Marine Conservation Zone (MCZ) assessment has been prepared in support of a Development Consent Order (DCO) application by National Grid Electricity Transmission plc (NGET, the 'Applicant') to the Planning Inspectorate, for the Eastern Green Link 3 (EGL 3) Project and the Eastern Green Link (EGL 4) Project (collectively referred to as 'the Projects'. The English Offshore Scheme comprises all elements of EGL 3 Project and EGL 4 Project which are within the English offshore environment, i.e. anything seaward of Mean High Water Springs (MHWS).

3.17.B.1.2 The EGL 3 Project is being developed by NGET and Scottish Hydro Electric – Transmission (SHE-T). It comprises a 2-gigawatt (GW) high voltage direct current (HVDC) system linking Peterhead in Scotland and Lincolnshire in England.

3.17.B.1.3 The EGL 4 Project is being developed by NGET and Scottish Power Transmission (SPT). It comprises a 2 GW HVDC system linking Fife in Scotland and Lincolnshire in England.

3.17.B.1.4 The EGL 3 Project and EGL 4 Project are separate projects, independent of one another in respect of their functional transmission capabilities; however, they have a common landfall at Anderby Creek on the Lincolnshire coastline, a common connection point to the existing transmission network in Norfolk and they also follow the same onshore cable route for the majority of their length. Therefore, the Projects are being consented by a single DCO, as two coordinated and predominantly co-located projects in England.

3.17.B.1.5 As detailed in **Volume 1, Part 1, Chapter 1: Introduction** of the Preliminary Environmental Impact Report (PEIR), the English Offshore Scheme is sited within the English marine environment, through inshore and offshore waters, and up to MHWS in England. The most northerly elements of the English Offshore Scheme would be located at the boundary of English waters where it meets Scottish waters, and the most southerly elements would be located at MHWS at Anderby Creek, along the Lincolnshire coastline, at landfall.

3.17.B.1.6 For the purposes of seeking the necessary consents, the EGL 3 Project and the EGL 4 Project have been split into different 'Schemes' i.e., English Onshore Scheme, English Offshore Scheme, Scottish Onshore Scheme and Scottish Offshore Scheme. These Schemes are outlined in **Volume 1, Part 1, Chapter 1: Introduction** of the PEIR. This assessment is written with specific regard to the English Offshore Scheme which will be consented by way of a deemed Marine Licence included within the DCO. The Scottish Offshore Scheme and Scottish Onshore Scheme will be consented by SHE-T separately to the DCO for the Projects.

3.17.B.2 Aim of this Report

3.17.B.2.1 The aim of the report is to seek agreement from the Planning Inspectorate, Marine Management Organisation (MMO) and the statutory nature conservation bodies (SNCBs) (Natural England (NE) and the Joint Nature Conservation Committee (JNCC)) that as a result of the findings of this Stage 1 Assessment, no Stage 2 Assessment is required for the EGL 4 Project.

3.17.B.2.2 The Applicant has undertaken a MCZ Screening Assessment, which is presented in **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** of the PEIR**.** The screening process identified two sites, which had the potential to be impacted. These sites are the Holderness Offshore MCZ and the Northeast of Farnes Deep (NEFD) Highly Protected Marine Area (HPMA). Upon further analysis as part of the screening process, it was concluded that impact pathways for the EGL 4 Project are capable of affecting (other than insignificantly) the protected features of the Holderness Offshore MCZ, , or the ecological or geomorphological processes on which the protected features are dependent, and the protected marine mammal features of the NEFD HPMA and that Stage 1 Assessment should be carried out. No sites were screened in for the EGL 3 Project. Therefore, only the EGL 4 Project will be considered within this Stage 1 Assessment.

3.17.B.2.3 This Stage 1 Assessment considers whether the EGL 4 Project presents any significant risk to achieving the conservation objectives of these sites. It is important to note that this Stage 1 Assessment is a 'likelihood' of risk rather than a 'certainty' of risk. The assessment of that risk is made in reference to the individual characteristics and environmental conditions of the site concerned.

3.17.B.2.4 If it is established that in isolation the EGL 4 Project has the potential to hinder the conservation objectives (i.e., the general management approach for the protected features) of the site in question, it will be progressed to a Stage 2 Assessment and the potential for in-combination effects will not be considered until that next stage. However, where a source-pathway-receptor has been established which will not lead to the hinderance of the conservation objectives on its own, consideration is then given to whether it could lead to hindrance of the conservation objectives in-combination with a similar source-pathway-receptor from another plan or project. If the potential cumulative effects would result in the hinderance of the conservation objectives, the EGL 4 Project would be progressed to a Stage 2 MCZ Assessment.

3.17.B.3 Structure of the Report

3.17.B.3.1 This report is structured into the following chapters:

- Chapter 1: (this chapter): Introduction to the report
- Chapter 2: Project Description (outlines the key aspects of the EGL 4 Project relevant to the Stage 1 MCZ Assessment)
- Chapter 3: Legislative Context
- Chapter 4: Screening Conclusion
- Chapter 5: Stage 1 Assessment
- Chapter 6: Stage 1 Conclusion

3.17.B.4 Competent Experts

3.17.B.4.1 This report was prepared by the CEA project team and quality checked and approved by Anna Farley. Anna holds a BSc in Marine Geography and a career spanning over 19 years whereby she has undertaken multiple environmental assessments in the UK under the Habitats Regulations for marine cable and offshore wind projects.

3.17.B.5 Project Description

English Offshore Scheme

3.17.B.5.1 A full project description of the English Offshore Scheme is reported in **Volume 1, Part 1, Chapter 4: Description of the Projects** of the PEIR**,** with significant levels of detail provided in **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** of the PEIR**.** This section provides a short summary of the Project and should be read in conjunction with the above stated chapters for further detail and understanding.

3.17.B.5.2 The EGL 4 Project comprises a 2 GW HVDC submarine cable system that will route through English offshore and inshore waters up to MHWS in England. The most northerly elements would be located at the boundary of English waters where it meets Scottish Waters, and the most southerly elements would be located at MHWS at Anderby Creek in Lincolnshire, at landfall. The offshore elements of the EGL 4 Project comprise approximately 425 km of subsea HVDC cable from the landfall at Anderby Creek, Lincolnshire, England to where it meets the marine boundary between English and Scottish waters. The submarine cable system would consist of two bundled HVDC cables and a fibre optic cable (up to the first offshore joint) for control and monitoring purposes.

3.17.B.5.3 The construction programme for the English Offshore Scheme would be expected to take approximately 55 months, commencing in 2028 / 2029 for both the EGL 3 Project and the EGL 4 Project.

3.17.B.5.4 As outlined in **Section 3.17.B.2.2**, this Stage 1 Assessment focuses solely on the offshore elements of the EGL 4 Project. A summary of key maximum design parameters for the EGL 4 Project are shown in **Table 3.17.B–1.**

Table 3.17.B–1: Summary of offshore Key Maximum Design Parameters of the EGL 4 Project

Parameter	Maximum design parameter for the EGL 4 Project
Offshore HVDC submarine cable corridor width	Nominally 500 m The surveyed corridor is 500 m wide but widens in certain sections to allow for future micro-routeing around seabed features such as sandwaves, challenging seabed conditions or sensitive habitats. The draft Order Limits align with the area surveyed.

Parameter	Maximum design parameter for the EGL 4 Project
Offshore HVDC submarine cable corridor total length in English Waters	~425 km
HVDC cables configuration	Bi pole (one cable per pole)
HVDC cables number	2
HVDC cables operating voltage	525 kV
HVDC cables transmission Capacity	2 GW
HVDC cables outer diameter	150-190 mm
Fibre optic cable number	1
Fibre optic cable outer diameter	20-30 mm
Cable trench number	1
Cable trench maximum depth	4 m (below seabed level)
Cable trench maximum width	5 m
Cable trench disturbed area	20 m
Separation distance between cable trenches (of each Project)	The EGL 3 Project and EGL 4 Project would be at least 500 m apart, narrowing as they approach the Anderby Creek Landfall to 50 m as it crosses MHWS
Maximum width of cable protection on seabed	10 m
Length of cable requiring boulder clearance using SCAR plough	125 km (estimated from length of boulder fields) in English waters <30%
Width of plough/cleared swathe	15 m swathe cleared
Total area of seabed disturbed by boulder plough	1.875 km^2
Depth of seabed disturbed by clearance plough	~10 cm (<2 m if trenching)
Length of cable requiring Pre-Lay Grapnel Run (PLGR)	425 km
Width of PLGR clearance corridor	30 m
Total area of seabed disturbed by PLGR	12.75 km^2
Length of cable requiring pre-sweeping (km)	8.28 km
Maximum pre-sweeping clearance width	20 m

Parameter	Maximum design parameter for the EGL 4 Project
Total area of seabed disturbed by pre-sweeping	0.17 km^2
Maximum volume of sediment disturbed by pre-sweeping	108,280.24 m^3
Total number of infrastructure crossings required	61
Typical length of crossing	100 m (at some locations crossings may be combined due to proximity of infrastructure)
Maximum width of crossing	10 m
Maximum height of rock berm	2 m
Maximum area of seabed covered by cable protection	1.135 km^2

3.17.B.6 Legislative Context

3.17.B.6.1 Section 126 (6) of the Marine and Coastal Access Act 2009 (MCAA) requires that applicants seeking to undertake an activity within the marine environment 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. At present, three HPMAs have been designated in UK waters as a type of MCZ under the MCAA. The NEFD HPMA, is located within the North Sea Region (the same region as the EGL 4 Project) and is within the 5 km EDR for the impact of underwater noise and therefore, it is included in the MCZ Assessment process. Dolphin Head HPMA and Allonby Bay HPMA are located 171.5 km and 336.2 km away from the EGL 4 Project, respectively. As such, these HPMAs are beyond the potential zone of influence (ZOI) for any impacts related to the EGL 4 Project and are not considered within this MCZ Assessment. Additionally, as the EGL 4 Project extends to the boundary between English and Scottish waters, any Nature Conservation Marine Protected Areas (NCMPA) that could be impacted by the English Offshore Scheme must also be considered under the MCAA and The Marine (Scotland) Act 2010.

3.17.B.6.2 There are three stages to the MCZ assessment process, with the outcome of each stage informing whether the assessment progresses to the next stage. The three stages are as follows:

- **Screening:** The process of identifying whether section 126 (6) should apply to the project. Screening identifies whether the licensable activity is taking place within or near to an MCZ/HPMA/NCMPA; 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.
- **Stage 1 assessment:** This stage considers whether there is a significant risk of the licensable activity hindering the achievement of the conservation objectives stated for the MCZ/HPMA. If it is determined that there is significant risk of the licensable activity hindering the achievement of the conservation objectives

stated, then the Stage 1 Assessment will progress to a Stage 2 Assessment. It will be necessary to consider whether there are other means of proceeding which could create a substantially lower risk, this could be done either as part of the Stage 1 Assessment (if significant risks are identified) or it may be more appropriate as part of the Stage 2 Assessment.

- **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 what measures the applicant will take to provide equivalent environmental benefit to compensate for the damage which the project will have on the MCZ/HPMA.

3.17.B.6.3 The initial screening process determined that the EGL 4 Project is capable of affecting either the protected features or the ecological or geomorphological processes on which the protected features are dependent on for the Holderness Offshore MCZ and the NEFD HPMA. As a result, these designated sites have been 'screened in' for further evaluation in the second stage of the process, the Stage 1 Assessment.

3.17.B.6.4 The MCZ Assessment is undertaken by the competent authority, which in this instance is the Secretary of State, based on information provided by the Applicant, in the form of an MCZ Assessment Report (this report).

3.17.B.7 Screening Conclusion

3.17.B.7.1 The Applicants MCZ Screening assessment (**Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** of the PEIR**)** reached the following conclusions:

- The NEFD HPMA was screened in for Stage 1 Assessment for the EGL 4 Project;
- The Holderness Offshore MCZ was screened in for Stage 1 Assessment for the EGL 4 Project;
- No MCZs/HPMAs were screened in for Stage 1 Assessment for the EGL 3 Project; and
- No NCMPAs were screened in for Stage 1 Assessment for the English Offshore Scheme.

3.17.B.7.2 **Table 3.17.B–2** provides a summary of the potential impacts screened into the Stage 1 Assessment for the protected features of the Holderness Offshore MCZ and NEFD HPMA.

Table 3.17.B–2: Summary of the Relevant Sites and Potential Impacts Screened into the Stage 1 Assessment for the EGL 4 Project

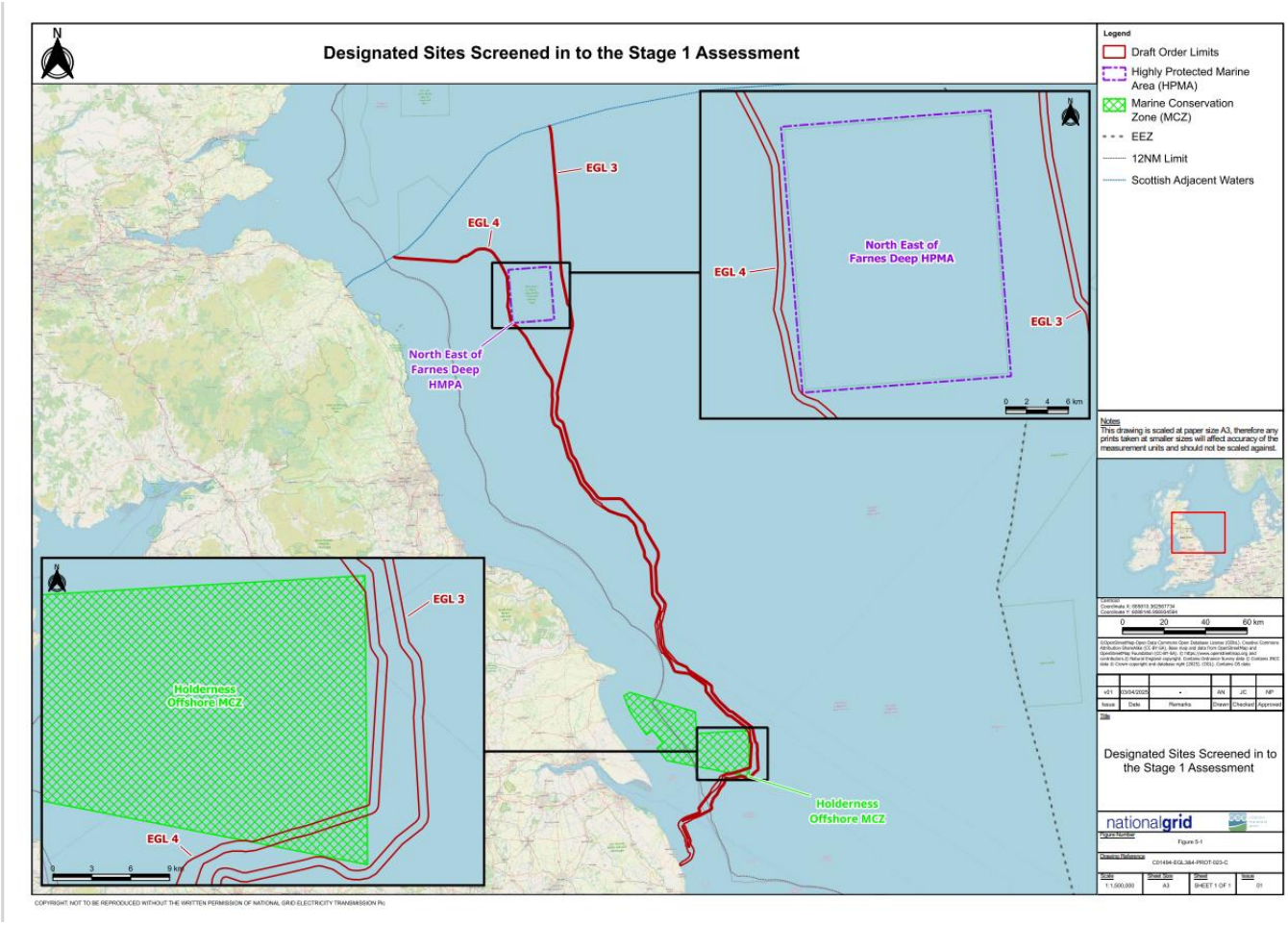
Site Name	Relevant Protected Feature	Potential Impact	Potential for In-combination Impact
Holderness Offshore MCZ	Geology: • North Sea glacial tunnel valley	Temporary habitat loss / seabed disturbance	Yes
		Permanent habitat loss	Yes
	Habitats: • Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand Benthic species: • Ocean quahog	Water flow (tidal current) changes, including sediment transport considerations	Yes
	Habitats: • Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand	Temporary increase and deposition of suspended sediments	Yes
Northeast of Farnes Deep HPMA	Important marine mammal species: • Harbour porpoise • White-beaked dolphin • Minke whale • Grey seal • Harbour seal	Underwater noise changes	Yes

3.17.B.8 Stage 1 Assessment

3.17.B.9 Overview

3.17.B.9.1 The MCZ screening process identified that there were source-receptor pathways for the Holderness Offshore MCZ and the NEFD HPMA and that a Stage 1 Assessment is required for the protected features, as summarised in **Table 3.17.B–2. Plate 3.17.B-1** illustrates the location of the Holderness Offshore MCZ and the NEFD HPMA in relation to the EGL 4 Project. It is important to note that the boundaries of the NEFD HPMA overlap entirely with the NEFD MCZ however, they remain as two distinct designations. The NEFD HPMA was 'screened in' to the Stage 1 Assessment for the impacts of changes in underwater noise for marine mammals. As the NEFD MCZ does not have marine mammals as a designated feature, it is not considered in the Stage 1 Assessment. While the NEFD MCZ shares the same broadscale habitat protected features as the NEFD HPMA, these features were 'screened out' of a Stage 1 Assessment for both designations in **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening.**

Plate 3.17.B-1: Designated Sites Screened into the Stage 1 Assessment



3.17.B.10 Stage 1 Assessment Methodology

3.17.B.10.1 The Stage 1 Assessment considers whether the EGL 4 Project presents any significant risk to achieving the conservation objectives of the Holderness Offshore MCZ and the NEFD HPMA. This Stage 1 Assessment is a 'likelihood' of risk rather than a 'certainty' of risk. The assessment of that risk is made in reference to the individual characteristics and environmental conditions of the MCZ/HPMA concerned.

3.17.B.10.2 If it is established that in isolation the EGL 4 Project has the potential to inhibit the conservation objectives (i.e. the general management approach for the protected features) of the site in question, it will be progressed to a Stage 2 Assessment, and the potential in-combination effects will not be considered by this Stage 1 Assessment.

3.17.B.10.3 Where a source-pathway-receptor has been established which will not lead to the hinderance of the conservation objectives on its own, consideration is given to whether the EGL 4 Project could in-combination with a similar source-pathway-receptor from another plan or project lead to a hinderance of the conservation objectives. If the in-combination effects result in the hinderance of the conservation objectives, it will be progressed to a Stage 2 Assessment.

3.17.B.11 Holderness Offshore MCZ

3.17.B.11.1 The EGL 4 Project crosses the Holderness Offshore MCZ for approximately 8.7 km. The Holderness Offshore MCZ supports numerous protected features that include broadscale subtidal habitats, a Species of Conservation Interest and a Feature of Geological Interest, as demonstrated in **Plate 3.17.B-2**. A detailed description of the Holderness Offshore MCZ and the conservation objectives for this site is located below.

3.17.B.11.2 The initial MCZ Screening assessment identified a pathway between the protected features of the Holderness Offshore MCZ and the following four impacts related to the EGL 4 Project:

- Temporary habitat loss/seabed disturbance;
- Permanent habitat loss;
- Water flow (tidal current) changes, including sediment transport considerations; and
- Temporary increase and deposition of suspended sediments.

Plate 3.17.B-2: Holderness Offshore MCZ

Site Description

3.17.B.11.3 Holderness Offshore MCZ is located approximately 11 km offshore from the Holderness coast in the Southern North Sea region. The Holderness Offshore MCZ boundary is intersected by the Territorial Seas limit and overlaps with part of the western area of the Southern North Sea SAC (REF 3.17.B.1). The MCZ ranges in depth from 15 m to 50 m and covers an area of 1,176 km^2. The EGL 4 Project lies in water depths between 25 m and 53 m within the Holderness Offshore MCZ.

3.17.B.11.4 The seabed of the Holderness Offshore MCZ is predominantly composed of sediment habitats, including subtidal sand, mixed and coarse sediment and contains the northern tip of the Silver Pit North Sea glacial tunnel valley. The heterogeneous seabed supports a wide range of species, both on and in the sediment, including multiple species of polychaete 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 (*Microstomus kitt*), plaice (*Pleuronectes platessa*) and European sprat (*Sprattus sprattus*). The slow growing and threatened/declining ocean quahog (*Arctica islandica*) has also been recorded within the site.

3.17.B.11.5 The site is dominated by European Nature Information System (EUNIS) habitat A5.1: Subtidal coarse sediment, covering an area of approximately 1,070 km^2. There are patches of A5.4: Subtidal mixed sediments located throughout the site with the largest patch located in the centre of the MCZ. Another patch lies over the northern tip of the North-valley glacial tunnel geomorphological feature, which is located in the southeast corner of the site. Small patches of A5.2: Subtidal sand, covering a total area of less than 25 km^2 are located within the site and are predominately situated near the periphery of the site.

Conservation Objectives

3.17.B.11.6 The conservation objectives for the Holderness Offshore MCZ are 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.

3.17.B.11.7 The conservation objectives for the individual protected features within the Holderness Offshore MCZ are outlined in **Table 3.17.B–3.**

Table 3.17.B–3: Holderness Offshore MCZ Conservation Objectives

Protected Features	Conservation Objectives
Subtidal coarse sediment Subtidal mixed sediments	Supplementary advice (REF 3.17.B.2) sets the following objectives for the sedimentary broadscale habitats: • Extent and distribution: Recover • Structure and function: Recover

Protected Features	Conservation Objectives
Subtidal sand	• Supporting processes: Maintain With respect to subtidal coarse sediment, subtidal sand and subtidal mixed sediments within the site, this means that: • Its extent is stable or increasing; and • 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.
Ocean quahog (*Arctica islandica*) **Species of Conservation Importance**	Supplementary advice (REF 2) sets the following objectives for ocean quahog: • Extent and distribution: Recover • Structure and function: Recover • Supporting processes: Recover With respect to the ocean quahog within the MCZ, 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.
North Sea glacial tunnel valley (Silver Pit)	With respect to the North Sea glacial tunnel valley within the MCZ, this means that: • Its extent, component elements and integrity are maintained. • Its structure and functioning are unimpaired; and • Its surface remains sufficiently unobscured for the purposes of determining whether the conditions in paragraphs (1) and (2) are satisfied. Any obscurement of that feature brought about entirely by natural processes is to be disregarded. Any alteration to that feature brought about entirely by natural processes is to be disregarded.

Relevant EGL 4 Project Activities

3.17.B.11.8 A summary of key maximum design parameters for the EGL 4 Project overlapping the Holderness Offshore MCZ are shown in **Table 3.17.B–4.**

3.17.B.11.9 As the area of the Holderness Offshore MCZ which overlaps with the EGL 4 Project is in English offshore waters (outside of 12 nautical miles from the shore), the laying and maintenance of cables within this overlapping area is an exempt activity pursuant to Section 81 of the MCAA, and therefore cable installation works in this area will not require a Marine Licence. However, deposit of dredged material and the deposit of external cable protection are licensable activities and would be included within the Deemed Marine Licence. To provide a holistic and complete overview of the impact of the EGL 4 Project on the MCZ, all works (exempt and non-exempt) associated with the construction, operation (and maintenance) and decommissioning of the EGL 4 Project have been assessed below as part of this Stage 1 Assessment.

Table 3.17.B–4: Summary of Key Design Parameters of the EGL 4 Project that Overlap the Holderness Offshore MCZ

Parameter	Maximum design parameter for the EGL 4 Project
Offshore HVDC submarine cable corridor width	Nominally 500 m The surveyed corridor is 500 m wide but widens in certain sections to allow for future micro-routeing around seabed features such as sandwaves, challenging seabed conditions or sensitive habitats. The draft Order Limits align with the area surveyed.
Offshore HVDC submarine cable corridor total length in MCZ	8.7 km
HVDC cables configuration	Bi-pole (one cable per pole)
HVDC cables number	2
HVDC cables operating voltage	525 kV
HVDC cables transmission Capacity	2 GW
HVDC cables outer diameter	150-190 mm
Fibre optic cable number	1
Fibre optic cable outer diameter	20-30 mm
Cable trench number	1
Cable trench maximum depth	4 m (below seabed level)
Cable trench maximum width	5 m
Cable trench disturbed area	20 m

Parameter	Maximum design parameter for the EGL 4 Project
Maximum length of remedial cable protection	6.8 km
Maximum width of cable protection on seabed	10 m
Length of cable requiring boulder clearance using SCAR plough	1 km
Width of plough/cleared swathe	15 m
Total area of seabed disturbed by boulder plough	0.015 km^2
Depth of seabed disturbed by clearance plough	~10 cm (<2 m if trenching)
Length of cable requiring Pre-Lay Grapnel Run (PLGR)	8.7 km
Width of PLGR clearance corridor	30 m
Total area of seabed disturbed by PLGR	0.261 km^2
Total number of crossings required	1 (Helvellyn Gas Pipeline [PL1956] and Control Umbilical)
Maximum length of crossing	100 m
Maximum width of crossing	10 m
Maximum height of rock berm	2 m

3.17.B.11.10 Two of the pressures established by the Marine Pressures-Activities Database v1.5 (REF 3.17.B.3): (1) abrasion/penetration of the substrate on the surface of the seabed; and (2) penetration and/or disturbance of the substratum below the surface of the seabed including abrasion, have been identified as activities which could cause an impact of temporary habitat loss and seabed disturbance.

3.17.B.11.11 Aspects of the EGL 4 Project that physically disturb the seabed include seabed preparation, cable burial and cable repair; these activities are all exempt activities associated with cable laying and maintenance. Typically, the extent of this disturbance will be 30 m wide along the extent of the area where the EGL 4 Project overlaps with the Holderness Offshore MCZ. Beyond this footprint, low intensity physical disturbance may also occur from vessel anchoring (although given the water depth it is unlikely that vessels would be routinely anchoring within the site) or Unexploded Ordnance (UXO) identification.

3.17.B.11.12 The worst-case installation footprint for temporary habitat loss is summarised in **Table 3.17.B–5.**

3.17.B.11.13 Most activities associated with the EGL 4 Project that penetrate the seabed will present a temporary impact i.e., will only be undertaken during installation and the seabed will be able to recover after the activity. Some activities will occur in the

same footprint and will be separated by several months e.g., PLGR followed by trenching. Abrasion and penetration of the substrate could result in the localised loss of damage to sediment habitats but does not directly remove habitats. However, a change in the habitat, even temporarily, could lead to an impact on species biodiversity and abundance within the area.

Table 3.17.B–5: Summary of Footprint for Temporary Habitat Loss

Phase	Construction *	Operation	Decommissioning
EGL 4 Project	0.261 km^2	To be confirmed	Would be the same as the construction plus operation footprint

* Equivalent to the footprint from the seabed clearance activity (PLGR). All other activities are assumed to be within this initial footprint.

3.17.B.11.14 Permanent habitat loss arises from the permanent change of one marine habitat type to another marine habitat type through the change in substratum including to artificial material (e.g., concrete). Associated EGL 4 Project activities include the installation of cables within the seabed (an exempt activity) and the deposition of external cable protection (non-exempt activity and will be covered by the Deemed Marine Licence). External cable protection would be used in the construction of an infrastructure crossing across the Helvellyn Pipeline within the area of overlap between the EGL 4 Project and the Holderness Offshore MCZ, and for burial remediation where full cable burial into sediment has not been achieved. Preliminary assessment has identified four locations (two high risk and two medium risk) where cable burial in sediment may not be viable due to loose sand overlying clay or hard substrate. As a result, the worst-case scenario for cable protection is that it would be needed for 6.8 km of the EGL 4 Project overlapping the Holderness Offshore MCZ, this includes the infrastructure crossing of the Helvellyn pipeline. Whilst most external cable protection would be installed during construction, it would also be required during the operation phase, either for the maintenance of infrastructure crossings or for remedial burial e.g., associated with a cable repair, or if the cables become exposed. The placement of external cable protection would result in the conversion of sands and gravels to hard substrate, altering the ecological composition and function of the affected area. Such changes can lead to shifts in benthic community structures, favouring sessile species adapted for hard substrates while displacing infaunal organisms, such as bivalves and polychaetes, who live within softer sediments. Taking a precautionary approach, it has been assumed that the external cable protection would not be removed at decommissioning and therefore it would be a permanent addition to these habitats.

3.17.B.11.15 As external cable protection is placed on the seabed surface, it can directly trap or block sediment transport, reducing sediment supply in down-drift locations. The addition of external cable protection to the marine environment can also cause changes in seabed currents. This has the potential to cause gentle erosion of the seabed and consequently cause scour surrounding the cable protection. In areas of scour, the increased seabed current has the potential to cause a shift in particle size distribution surrounding the cable protection, by suspending and transporting away the finer sediments, and increasing turbidity (REF 3.17.B.4). Although little

evidence is available for the occurrence of scour in coarse and mixed sedimentary environments.

3.17.B.11.16 The worst-case installation footprint for permanent habitat loss is summarised in **Table 3.17.B–6.**

Table 3.17.B–6: Summary of Footprint for Permanent Habitat Loss

Phase	Construction	Operation	Decommissioning
EGL 4 Project	0.068 km^2	To be confirmed	Would be the same as the construction plus operation footprint

3.17.B.11.17 The exempt activities during construction, operation and decommissioning of the EGL 4 Project have the potential to temporarily increase suspended sediments. This can create sediment plumes within the water column that can travel away from the EGL 4 Project before the sediment is deposited on the seabed. Additionally, once deposited, these plumes can cause smothering of habitats and features.

3.17.B.11.18 Immediately adjacent to the northeast corner of the MCZ (outside of the MCZ boundary) are sandwaves where pre-sweeping may need to be carried out prior to cable burial. This would cause an increase and deposition of suspended sediments, causing smothering of the habitats and protected features within the MCZ. The EGL 4 Project has been widened at this position to route across the northeast corner of the MCZ, so that the EGL 4 Project could potentially avoid the sandwaves and avoid the need for pre-sweeping. Cable burial in sediment, although within the MCZ, would have a lower environmental impact and would offer a more sustainable solution in terms of cable protection. However, taking a precautionary approach, pre-sweeping outside of the MCZ has been considered by the assessment. No pre-sweeping has been identified within the MCZ.

3.17.B.11.19 Project specific data presented in (as per **Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes**), suggests coarse sediment plumes, created from pre-lay and cable trenching activities, will settle from the water column within the draft Order Limits and will cause light smothering of <5 cm, and fine sediment will cause lighter smothering of <2 mm up to 17.5 km from pre-lay and cable trenching activities, dependent upon peak flow speed. For Trailing Suction Hopper Dredger (TSHD) activities, coarse sediment will settle within the draft Order Limits and cause light smothering of <5 cm (from one pass of the TSHD), and fine sediment will cause lighter smothering of <2 mm out to a maximum distance of 11.7 km, dependent upon peak flow speed. If the EGL 3 and EGL 4 Projects were to be constructed simultaneously, then fine sediment deposition could overlap but this will not exceed 5 cm. There will be no heavy smothering as a result of the English Offshore Scheme and heavy smothering will not be considered in this assessment.

3.17.B.11.20 The maximum distance from trenching activities where suspended sediment concentrations exceed 10 mg/l is between 2.7 and 6.5 km past KP 10. Suspended sediment concentrations exceed 10 mg/l for a maximum distance of 4 km from TSHD activities.

Assessment

North Sea Glacial Tunnel Valley

3.17.B.11.21 Tunnel valleys are geological features, widespread throughout the North Sea (REF 3.17.B.5). They are characterised as seabed depressions formed by the occurrence of subsea glacial erosion and sediment backfill below the edges of sea surface glacial coverings (REF 3.17.B.6). The North Sea glacial tunnel valley present within the Holderness Offshore MCZ is situated to the southeast of the MCZ, is approximately 50 m deep and spans an area of 19.2 km^2 (**Plate 3.17.B-2**). The EGL 4 Project crosses the North Sea glacial tunnel valley for approximately 3.5 km.

3.17.B.11.22 The habitats present within the EGL 4 Project that interact with the North Sea glacial tunnel valley include deep circalittoral mixed sediment, deep circalittoral coarse sediment and circalittoral coarse sediment (REF 3.17.B.7). Survey grab data revealed that sand and gravel are the dominating sediments within these habitats, with the frequent occurrence of boulders, cobbles and pebbles (REF 3.17.B.8). Camera transect data from the EGL 4 English Environmental Baseline Survey (EGL 4 EEBS) (REF 3.17.B.8) revealed the dominance of sessile organisms including a range of Bryozoa and Hydrozoa, barnacles, the American slipper limpet *(Crepidula fornicata),* deadman's finger (*Alcyonium digitatum)*, the beadlet anemone (*Actinia equina)* and the Dahlia anemone (*Urticina felina).* Camera transect data also noted the presence of mobile fauna including crustacea (such as hermit crabs, the edible crab (*Cancer pagurus)* and the velvet crab (*Necora puber)),* bivalves (such as the great scallop (*Pecten maximus)* and razor clams), brittlestars and the common starfish (*Asteria rubens)*. The observed fauna is characteristic of mixed and coarse sediment habitats.

3.17.B.11.23 It was noted during the EGL 4 EEBS that the cameras experienced strong seabed currents through the North Sea glacial tunnel valley within the Holderness Offshore MCZ (REF 3.17.B.8).

3.17.B.11.24 The full assessment can be seen in **Table 3.17.B–7.**

Table 3.17.B–7: Assessment of Impacts on North Sea Glacial Tunnel Valley

Impact	Evidence
Temporary habitat loss/seabed disturbance	Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2), with strong seabed currents noted to be present within the North Sea glacial tunnel valley (REF 3.17.B.8). Therefore, the sessile organisms within the habitats of the North Sea glacial tunnel valley are subject to and can tolerate a natural level of seabed disturbance. Furthermore, any temporary habitat loss/seabed disturbance would be observed in the habitats overlying the geomorphological feature, rather than within the feature itself. The mobile fauna present within overlying habitats can temporarily relocate as sediment is displaced but return once EGL 4 Project activities have finished. Typically, species associated with subtidal coarse and mixed sediment habitats demonstrate rapid recruitment and recolonisation following seabed disturbance (REF 3.17.B.9). It is expected that there would be very

Impact	Evidence
	little change from baseline conditions during cable construction, operation and decommissioning, or where any change did occur, recovery from such change would occur within less than six months.
Permanent habitat loss	Preliminary review of geophysical and geotechnical data identified that the potential areas of cable protection needed within the MCZ overlap the North Sea glacial tunnel valley for approximately 1.2 km. The footprint of the external cable protection within the feature would be 0.012 km^2; equivalent to a loss of 0.06 % of the habitats overlying the North Sea glacial tunnel valley. Cable protection would be installed only where considered necessary for the safe operation of the EGL 4 Project and, where possible, cable protection materials would be selected to match the environment (e.g., when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment will be used as an alternative to terrestrially sourced granite).It is anticipated that this impact may have the capacity to effect the habitats overlying the geomorphological feature, but will not impact the feature itself which is not sensitive to habitat loss as a result of cable protection. A review of literature by Wallingford (2025) (REF 3.17.B.10) reports that external rock protection is colonised by primary and secondary users, with amphipods, hydroids and anemones demonstrating colonisation of artificial rock protection within subtidal habitats in the North Sea. Primary colonisers, such as tubeworms and hydroids, initially colonise the artificial rock; these are then displaced between 2 - 4 years later by secondary colonisers, such as anemones, which can dominate the artificial rock for up to 11 years post construction. Additionally, the rock protection provides additional hard substrate for mobile demersal megafauna such as lobsters and crabs. This evidence suggests the introduction of hard substrate may result in increased biodiversity and faunal abundance within the habitats overlying the North Sea glacial tunnel valley. Some of the sessile species present within the North Sea glacial tunnel valley and associated with the coarser sediments, such as the beadlet anemone and the Dahlia anemone, may eventually colonise artificial rock structures whilst the crustacea present within the habitat may utilise the structure for shelter. While it is acknowledged that there would be a loss of 0.06 % of the habitats overlying the North Sea glacial tunnel valley, this protected feature is in favourable condition. Therefore, in relation to the conservation objectives, the change is insignificant and the overall extent of the broadscale sediment features remain stable. This is also applicable for the structure, function, quality, and composition of associated biological communities. There will be localised changes to the biological communities within the direct footprint of external cable protection as habitat has been lost, however these areas will be isolated pockets of change that do not impact the geomorphological feature itself which underlies sedimentary habitats. When considering the wider context of the Protected Feature, the North Sea glacial tunnel valley will not deteriorate.

Impact	Evidence
Water flow (tidal current) changes, including sediment transport considerations	Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2), with strong seabed currents noted to be present within the North Sea glacial tunnel valley (REF 3.17.B.8). Where cable protection is required, the resultant small changes to depths will only result in small magnitude and very localised changes in water flow immediately surrounding the cable protection (**Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes**). A report by ABPmer (2024) (REF 3.17.B.4) for cable protection used on IFA 2000[1] suggests any scour that may occur will be localised and the effect considered negligible with little detectable change from baseline conditions , with no potential to impact the structure and function of this geomorphological feature.
Conclusion	
The North Sea glacial tunnel valley is in favourable condition. Any deterioration to the area within the boundary of this protected feature would be observed in overlying habitats rather than the geological feature itself which is resilient to the impacts which may occur as a result of the Projects. Any temporary habitat loss/seabed disturbance would be localised and temporary, with the habitats overlying this protected feature returning to baseline conditions within six months. It is not anticipated that the feature will be in any way obscured or altered. Any deterioration within the boundary of this to this protected feature as a result of permanent habitat loss will be observed in overlying habitats and will be localised and insignificant, with evidence to suggest the macrofauna associated with the coarser sediment may colonise artificial cable protection, potentially increasing biodiversity and abundance compared to the baseline conditions. Pressures related to water flow changes are predicted to be negligible. **Therefore, the EGL 4 Project will not hinder the achievement of conservation objectives for this feature.**	

Subtidal Coarse Sediments

3.17.B.11.25 Subtidal coarse sediments include coarse sand, gravel, pebbles, shingle and cobbles which are often unstable due to strong tidal currents and high energy wave action; this tidal energy prevents large volumes of finer sand and mud from settling within these habitats. Fauna associated with subtidal coarse sediments includes: brittlestars, amphipods, polychaetes, bivalves and burrowing anemones (REF 3.17.B.11).

3.17.B.11.26 Within the EGL 4 Project, the subtidal coarse sediment habitats within the Holderness Offshore MCZ are dominated by gravel, with a greater occurrence of cobbles and pebbles to the east of Silver Pit. Mud and sand are also present, with sand present in greater proportion than mud. Strong seabed current was noted to be present at two camera transect locations (REF 3.17.B.8).

[1] Analogous cable project where cable protection is proposed to be deposited within a MCZ on subtidal coarse sediment and subtidal mixed sediment. Water depths at deposit locations are between 3.4 m and 8.6 m indicating that the locations will be subject to high wave energy than experienced within the Holderness Offshore MCZ.

3.17.B.11.27 Camera transect data showed a dominance of sessile organisms including Bryozoa, Hydrozoa, the beadlet anemone, the Dahlia anemone and barnacles. Mobile fauna present in these habitats include crustacea (such as hermit crabs and the edible crab*),* sea slugs (nudibranchia), bivalves (such as razor clams and the great scallop*),* and echinoderms including the common starfish*,* the common sunstar (*Crossaster papposus),* the common sea urchin (*Echinus esculentus)* and brittlestars (REF 3.17.B.8).

3.17.B.11.28 Subtidal coarse sediment is the dominant habitat within the Holderness Offshore MCZ, spanning 1,076 km^2. Of this 1,076 km^2, approximately 3.2 km^2 is present within the area of overlap with the EGL 4 Project , which interacts with subtidal coarse sediment within the MCZ for a total distance of 4.7 km (**Plate 3.17.B-2**). Within this habitat it is anticipated that boulder clearance would be required as well as the standard seabed preparation activities such as PLGR.

3.17.B.11.29 The full assessment can be seen in **Table 3.17.B–8.**

Table 3.17.B–8: Assessment of Impacts on Subtidal Coarse Sediments

Impact	Evidence
Temporary habitat loss/seabed disturbance	0.141 km^2 of seabed within this broadscale habitat would be temporarily disturbed during construction and decommissioning; equivalent to 0.013% of the habitat within the MCZ. During boulder clearance, boulders, cobbles and rocks can be rotated causing the smothering and crushing of sessile organisms (Readman and Watson, 2024, [12]). Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2), with strong seabed currents noted to be present at two camera transects, EGL4_63 and EGL4_64, within subtidal coarse sediment habitats (REF 3.17.B.8). Therefore, the sessile organisms within these coarse sediment habitats are subject to and can tolerate a natural level of seabed disturbance. Additionally, the mobile fauna present within these habitats can temporarily relocate as sediment is displaced but return once EGL 4 Project activities have finished. Typically, species associated with subtidal coarse sediment habitats demonstrate rapid recruitment and recolonisation following seabed disturbance (REF 3.17.B.9). It is expected that there would be very little change from baseline conditions during cable construction, operation and decommissioning, and recovery from any change would occur within less than six months.
Permanent habitat loss	The EGL 4 Project crosses Helvellyn Pipeline in the MCZ within an area of subtidal coarse sediment; external cable protection (of 0.001 km^2) will be required at this infrastructure crossing. Preliminary review of geophysical and geotechnical data has also identified approximately 1.9 km of the cable route within subtidal coarse sediment is at high risk of inadequate cable burial and approximately 2.2 km of the route that is at medium risk of inadequate cable burial, both due to the presence of loose sand overlying clay. It is estimated that a maximum area of 0.041 km^2 of cable protection is required within areas of subtidal coarse sediment within the MCZ; this is

Impact	Evidence
	equivalent to 0.004 % of the subtidal coarse sediment habitats present within the MCZ. Cable protection would be installed only where considered necessary for the protection of the EGL 4 Project and, where possible, cable protection materials would be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment will be used as an alternative to terrestrially sourced granite). A review of literature by Wallingford (2025) (REF 3.17.B.10) reports that external rock protection is colonised by primary and secondary users, with amphipods, hydroids and anemones demonstrating colonisation of artificial rock protection within subtidal habitats in the North Sea. Primary colonisers, such as tubeworms and hydroids, initially colonise the artificial rock; these are then displaced between 2 - 4 years later by secondary colonisers, such as anemones, which can dominate the artificial rock for up to 11 years post construction. Additionally, the rock protection provides additional hard substrate for mobile demersal megafauna such as lobsters and crabs. This evidence suggests the introduction of hard substrate may result in increased biodiversity and faunal abundance within the subtidal coarse sediment habitat. Some of the sessile species present within the broadscale habitat, such as the beadlet anemone and the Dahlia anemone, may eventually colonise artificial rock structures whilst the crustacea present within the habitat may utilise the structure for shelter. In relation to the conservation objectives, the change is minor and will not affect the structure, function, quality, and composition of associated biological communities. There will be localised changes to the biological communities within the direct footprint of rock cable protection as the mixed sediment habitat has been lost, however these areas will be isolated pockets of change. When considering the wider context of this protected feature the health of biological communities associated with these habitats will not deteriorate.
Water flow (tidal current) changes, including sediment transport considerations	Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2), with strong seabed currents noted to be present at two camera transects, EGL4_63 and EGL4_64, within subtidal coarse sediment habitats (REF 3.17.B.8). Where cable protection is required, the resultant small changes to depths will only result in small magnitude and very localised changes in water flow immediately surrounding the cable protection (**Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes).** A report by ABPmer (2024) (REF 3.17.B.4) for cable protection used on IFA 2000[1] suggests any scour that may occur will be localised and the effect considered negligible with little detectable change from baseline conditions.

Impact	Evidence
Temporary increase and deposition of suspended sediments	The sediment present within the subtidal coarse sediment habitats within the MCZ is dominated by gravel; for example, grab sample EGL4_63_EBS comprised of 49.8 % gravel. Coarse sediment plumes from trenching activities settle from the water column within the draft Order Limits and can cause light smothering of <5 cm. Finer sediment such as mud and sand are present within the subtidal coarse sediment habitats within the MCZ, with mud contributing <10 % of the total sediment composition. Fine sediment plumes, caused by trenching, can travel up to 17.5 km from the source of trenching and, once deposited, can cause light smothering of up to 2 mm on the seabed. Species within the habitat demonstrate a medium sensitivity to the pressure. Increased suspended sediment can clog the feeding apparatus and gill filaments of suspension feeders, such as bivalves, reducing respiration and feeding (REF 3.17.B.13); however, bivalves can burrow into the sediment and anemones can retract their tentacles to avoid periods of increased turbidity. Additionally, mobile fauna present within subtidal coarse sediment, such as crabs, can temporarily relocate during periods of increased turbidity and to avoid smothering from sediment deposition. The change in suspended sediment concentrations will be brief and any smothering will be insufficient to change the character of the habitat. Additionally, this moderate high tidal energy is likely to remove all light smothering (<5 cm) from sediment deposition.
Conclusion	
The conservation objectives for subtidal coarse sediment within the Holderness Offshore MCZ is recover for extent/distribution and structure/function. Subtidal coarse sediment experiences seabed disturbance from naturally occurring moderate energy seabed currents. Additionally, any deterioration to this protected feature as a result of temporary habitat loss/seabed disturbance and temporary increase and deposition of suspended sediments would be localised and temporary. It is understood that most biotopes characterised by coarse sediment habitats are resilient to temporary habitat loss due to opportunistic species which are likely to recruit rapidly. Therefore, little detectable change from baseline conditions would occur and only for a short period, with recovery expected in the short term. The evidence suggests there would be negligible impact. Any deterioration to this protected feature as a result of permanent habitat loss will be localised and minor, with evidence to suggest the macrofauna present within this protected feature may colonise artificial rock protection, increasing biodiversity and abundance. Pressures related to water flow changes are predicted to be negligible. **Therefore, the EGL 4 Project will not hinder the achievement of conservation objectives for this feature.**	

Subtidal Mixed Sediments

3.17.B.11.30 Subtidal mixed sediments are comprised of a poorly sorted combination of fine sands, silts and muddy sediments, interspersed with coarse gravel, shingle and cobbles. High substrate heterogeneity creates a mosaic of habitats which support diverse communities of fauna; polychaetes, bivalves and echinoderms are present within the soft sediment of this habitat (REF 3.17.B.14) whilst the larger substrate

within the mixed sediments provides a hard surface for sessile organisms, such as Bryozoa and hydroids, to attach to.

3.17.B.11.31 Within the EGL 4 Project, the subtidal mixed sediment habitats within the Holderness Offshore MCZ are comprised of sand and gravel, with gravel contributing to a greater proportion of the sediment composition. The presence of pebbles, cobbles and boulders ranges from occasional, frequent and abundant within these habitats (REF 3.17.B.8).

3.17.B.11.32 Camera transect data revealed the dominance of sessile organisms including a range of Bryozoa and Hydrozoa, barnacles, the American slipper limpet, deadman's finger, the beadlet anemone and the Dahlia anemone. Camera transect data also noted the presence of mobile fauna including crustacea (such as hermit crabs, the edible crab and the velvet crab), bivalves (such as the great scallop and razor clams), brittlestars and the common starfish.

3.17.B.11.33 Subtidal mixed sediments are the second most dominant habitats within the Holderness Offshore MCZ, spanning approximately 81 km^2. Of this 81 km^2, approximately 2.6 km^2 is present within the area of overlap with the EGL 4 Project , which interacts with subtidal coarse sediment within the MCZ for a total distance of 4 km (**Plate 3.17.B-2).** Within this habitat, it is anticipated that PLGR, trenching and external cable protection would be required.

3.17.B.11.34 The full assessment can be seen in **Table 3.17.B–9**.

Table 3.17.B–9: Assessment of Impacts on Subtidal Mixed Sediments

Impact	Evidence
Temporary habitat loss/seabed disturbance	0.12 km^2 of seabed within this broadscale habitat would be temporarily disturbed during construction and decommissioning; equivalent to 0.15% of the habitat within the MCZ. Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2), Therefore, the sessile organisms within subtidal mixed sediment habitats are subject to and can tolerate a natural level of seabed disturbance. Additionally, the mobile fauna present within these habitats can temporarily relocate as sediment is displaced but return once EGL 4 Project activities have finished. Typically, species associated with subtidal mixed sediment habitats demonstrate rapid recruitment and recolonisation following seabed disturbance (REF 3.17.B.9). Furthermore, the subtidal mixed sediment habitats within the MCZ are comprised of sand and gravel. Subtidal sands and gravels, which are commonly found in the North Sea and present within the area of overlap with the EGL 4 Project in multiple locations outside of the MCZ, are highly mobile (REF 3.17.B.15). Thus, subtidal sands and gravels habitats have a low sensitivity to seabed disturbance. Due to their dynamic nature, it would be expected that these habitats would return to baseline conditions within <12 months of abrasion and penetration (REF 3.17.B.16).
Permanent habitat loss	Preliminary review of geophysical and geotechnical data has identified approximately 2.7 km of the cable route within subtidal

Impact	Evidence
	mixed sediment is at high risk of inadequate cable burial due to the presence of loose sand overlying clay. It is therefore anticipated that 0.027 km^2 of cable protection is required within areas of subtidal mixed sediment within the MCZ; equivalent to 0.03 % of the subtidal mixed sediment habitats present within the MCZ. Cable protection would be installed only where considered necessary for the protection EGL 4 Project and, where possible, cable protection materials would be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment will be used as an alternative to terrestrially sourced granite). A review of literature by Wallingford (2025) (REF 3.17.B.10) reports that external rock protection is colonised by primary and secondary users, with amphipods, hydroids and anemones demonstrating colonisation of artificial rock protection within subtidal habitats in the North Sea. Primary colonisers, such as tubeworms and hydroids, initially colonise the artificial rock; these are then displaced between 2 - 4 years later by secondary colonisers, such as anemones, which can dominate the artificial rock for up to 11 years post construction. Additionally, the rock protection provides additional hard substrate for mobile demersal megafauna such as lobsters and crabs. This evidence suggests the introduction of hard substrate may result in increased biodiversity and faunal abundance within the subtidal coarse sediment habitat. Some of the sessile species present within the broadscale habitat, such as the beadlet anemone and the Dahlia anemone , may eventually colonise artificial rock structures whilst the crustacea present within the habitat may utilise the structure for shelter In relation to the conservation objectives, the change is minor and will not affect the structure, function, quality, and composition of associated biological communities. There will be localised changes to the biological communities within the direct footprint of rock cable protection as the mixed sediment habitat has been lost, however these areas will be isolated pockets of change. When considering the wider context of this protected feature the health of biological communities associated with these habitats will not deteriorate.
Water flow (tidal current) changes, including sediment transport considerations	Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2). Furthermore, the subtidal mixed sediment habitats within the MCZ are comprised of sand and gravel; subtidal sands and gravels habitats are naturally subject to high wave energy. Where cable protection is required, the resultant small changes to depths will only result in small magnitude and very localised changes in water flow immediately surrounding the cable protection (**Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes**). A report by ABPmer (2024) (REF 3.17.B.4) for cable protection used on IFA 2000[1] suggests any scour that may occur will be localised and the

Impact	Evidence
	effect considered negligible with little detectable change from baseline conditions.
Temporary increase and deposition of suspended sediments	The sediments present within the subtidal mixed sediment habitats within the MCZ are sand and gravel. Coarse sediment plumes from trenching activities settle from the water column within the draft Order Limits and can cause light smothering of <5 cm. Increased suspended sediment can clog the feeding apparatus and gill filaments of suspension feeders, such as bivalves, reducing respiration and feeding (REF 3.17.B.13); however, bivalves can burrow into the sediment and anemones can retract their tentacles to avoid periods of increased turbidity. Additionally, mobile fauna present within subtidal coarse sediment, such as crabs, can temporarily relocate during periods of increased turbidity and to avoid smothering from sediment deposition. The change in suspended sediment concentrations will be brief and any smothering will be insufficient to change the character of the habitat. Additionally, this moderate high tidal energy is likely to remove all light smothering (<5 cm) from sediment deposition.
Conclusion	
The conservation objectives for subtidal mixed sediment within the Holderness Offshore MCZ is recover for extent/distribution and structure/function. Subtidal mixed sediment experiences seabed disturbance from naturally occurring moderate energy seabed currents. Additionally, any deterioration to this protected feature as a result of temporary habitat loss/seabed disturbance and temporary increase and deposition of suspended sediments would be localised and temporary. Therefore, little detectable change from baseline conditions would occur and only for a short period. The evidence suggests there would be negligible impact. Any deterioration to this protected feature as a result of permanent habitat loss will be localised and minor, with evidence to suggest the macrofauna present within this protected feature may colonise artificial rock protection, increasing biodiversity and abundance. Pressures related to water flow changes are predicted to be negligible. **Therefore, the EGL 4 Project will not hinder the achievement of conservation objectives for this feature.**	

Subtidal Sand

3.17.B.11.35 Subtidal sands occur in small, interspersed patches within the Holderness Offshore MCZ, covering a total area of 3.7 km^2. Subtidal sands are characterised by infaunal species including bivalves and polychaetes and experience high energy wave action, making the sediment mobile (REF 3.17.B.17).

3.17.B.11.36 The EGL 4 Project overlaps a patch of subtidal sand by 0.14 km^2 at the northeast corner of the MCZ (**Plate 3.17.B-2)**; a cable route would intersect the broadscale habitat for approximately 431 m**.** This location is where the EGL 4 Project has been widened to avoid an area of sandwaves immediately adjacent to the MCZ border. If the EGL 4 Project routes through the area of sandwaves, then pre-sweeping would be required.

3.17.B.11.37 The EGL 4 EBBS classified the habitat within this area as Circalittoral coarse sediment (gravelly sand variant) (MC321) (83.9% sand, 14.3% gravel). The following species were identified as present within the habitat through grab and camera transects; starfish including the common starfish and the sand sea star (*Astropecten irregularis),* crabs, barnacles, Bryozoa, anemones, the ross worm (*Sabellaria spinulosa),* razor clams, and other bivalves as evident by siphons.

3.17.B.11.38 The full assessment of the impact on this feature is presented in **Table 3.17.B–10**.

Table 3.17.B–10: Assessment of Impacts on Subtidal Sand

Impact	Evidence
Temporary habitat loss/seabed disturbance	The widest footprint caused by the EGL 4 Project will be 30 m. If the final cable route was within this broadscale habitat a footprint of 0.013 km^2 would be temporarily disturbed; approximately 0.35% of the total area of the habitat within the MCZ. The EGL 4 EEBS classified the habitat within this area as Circalittoral coarse sediment (gravelly sand variant) (MC321) (83.9% sand, 14.3% gravel). Subtidal sands and gravels, which are commonly found in the North Sea and present within the EGL 4 draft Order Limits in multiple locations outside of the MCZ, are highly mobile (REF 3.17.B.15). Thus, subtidal sands and gravels habitats have a low sensitivity to seabed disturbance. Due to their dynamic nature, it would be expected that these habitats would return to baseline conditions within <12 months of abrasion and penetration (REF 3.17.B.16). Additionally, temporary habitat loss to subtidal sands and gravels would have little effect on their wider distribution in the MCZ and North Sea.
Permanent habitat loss	Preliminary investigations have not identified that external cable protection is needed within subtidal sand habitats within the MCZ thus there will be no permanent habitat loss to this protected feature.
Water flow (tidal current) changes, including sediment transport considerations	Water depth is approximately 38 m at this location within the EGL 4 Project. Preliminary investigations have not identified that external cable protection would be needed within the subtidal sands habitat and therefore there would be not pathway for water flow changes.
Temporary increase and deposition of suspended sediments	Coarse sediment plumes from trenching activities settle from the water column within the draft Order Limits and can cause light smothering of <5 cm. For TSHD activities, coarse sediment will settle within the draft Order Limits and cause light smothering of <5 cm (from one pass of the TSHD). Suspended fine sediments can travel up to 17.5 km from trenching activities and 11.7 km from TSHD activities. Thus, sediment deposition from pre-sweeping within the EGL 4 Project adjacent to the northeast the Holderness Offshore MCZ will occur within the Holderness Offshore MCZ. This sediment will settle on the subtidal sand habitat within the MCZ, potentially causing light smothering of <5 cm thickness. The subtidal sands are subject to moderately high current strengths, which is likely to remove all light smothering (<5 cm) from sediment deposition. The

Impact	Evidence
	species present have low sensitivity to light smothering, with bivalve species able to migrate through up to 50 cm of sediment easily. It is not anticipated that a temporary increase and deposition of suspended sediment will have a adverse effect on the subtidal sand habitats within the MCZ.
Conclusion	
The conservation objectives for subtidal sands within the Holderness Offshore MCZ is recover for extent/distribution and structure/function. Subtidal sands and gravels, which are commonly found in the North Sea and present within the EGL 4 Project in multiple locations outside of the MCZ, are highly mobile (REF 3.17.B.15) and demonstrate a low sensitivity to seabed disturbance. Any deterioration to this protected feature as a result of temporary habitat loss /seabed disturbance and temporary increase and deposition of suspended sediments will be localised and temporary. Pressures related to permanent habitat loss and water flow changes are not applicable to this protected feature. **Therefore, the EGL 4 Project will not hinder the achievement of conservation objectives for this feature.**	

Ocean Quahog

3.17.B.11.39 The ocean quahog (*Arctica islandica*) is a marine bivalve that occurs in sandy and muddy sediments from the low intertidal zone to 400 m water depths within the Irish Sea and North Sea. The ocean quahog is one of the longest lived and slowest growing marine bivalves; the growth rate of ocean 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 (REF 3.17.B.18). Ocean quahog are thought to have a high sensitivity to physical loss of habitat and are included in the Oslo and Paris Convention (OSPAR) list of threatened and/or declining species (REF 3.17.B.19), with seabed disturbance from anthropogenic activities being a main threat to this species (REF 3.17.B.20).

3.17.B.11.40 Known locations of ocean quahog within the Holderness Offshore MCZ are situated to the west of the EGL 4 Project (REF 3.17.B.21), with the closest presence 18 km from the EGL 4 Project, as shown in **Plate 3.17.B-2**. This is further supported as benthic surveys using underwater cameras and macrofauna grab samples did not identify ocean quahog within the EGL 4 Project (REF 3.17.B.8). The full assessment can be seen in **Table 3.17.B–11.**

Table 3.17.B–11: Assessment of Impacts on Ocean Quahog

Impact	Evidence
Temporary habitat loss/seabed disturbance	As mentioned above, benthic surveys revealed that the EGL 4 Project does not route through known areas of ocean quahog presence within the MCZ (REF 3.17.B.8). The sediments present within the EGL 4 Project predominantly have a high gravel content

Impact	Evidence
	(>49%) with <10% mud content. Ocean quahog is predominantly found in sand and muddy sand that ranges from coarse to fine grains into which they bury or part bury (REF 3.17.B.18). The high gravel content within the EGL 4 Project means that the sediments are not preferential for ocean quahog. Therefore, none of the associated works of the EGL 4 Project will cause seabed disturbance or temporary habitat loss for ocean quahog.
Permanent habitat loss	The EGL 4 Project does not route through known areas of ocean quahog presence within the MCZ. No external cable protection will be needed in the areas known to support ocean quahog and therefore permanent habitat loss will not occur in areas associated with ocean quahog.
Water flow (tidal current) changes, including sediment transport considerations	Since the nearest population of ocean quahog within the MCZ is located approximately 18 km from the EGL 4 Project, this species will not be impacted by any changes in water flow resulting from external cable protection. Any changes in water flow will be highly localised, affecting only the immediate area where cable protection is required.
Conclusion	
None of the activities associated with the EGL 4 Project will occur within areas of known ocean quahog presence in the Holderness Offshore MCZ. **Therefore, the EGL 4 Project will not hinder the achievement of conservation objectives for this feature.**	

In-combination Effects

3.17.B.11.41 Existing plans/projects that it is anticipated will be built and operational prior to the construction phase of the EGL 4 Project will be considered to assess in-combination effects. The Hornsea Project Four (export cable corridor) was identified within 0.6 km of the EGL 4 Project (REF 3.17.B.22). As temporary and permanent habitat loss and changes in waterflow are restricted to within the MCZ, the Hornsea Project Four is only assessed in-combination for the impact of a temporary increase and deposition of suspended sediments.

3.17.B.11.42 Two planned subsea cable projects which could intersect the MCZ were identified through review of the Planning Inspectorate portal and the MMO Marine Case Management System Public Register; Ossian Offshore Wind Farm Transmission Infrastructure and Eastern Green Link 5 (EGL 5). Whilst cable route information is available for EGL 5, important metrics such as the footprint of trenching activities or external cable protection are not currently available. Thus, worst-case scenario assessments for permanent habitat loss and temporary increase and deposition of suspended sediments cannot be considered in-combination with the EGL 5 Project. Without routeing details, Ossian cannot be assessed in-combination at this stage. Ossian and EGL 5 publications will be monitored and engagement will be undertaken, and if information becomes available, they would be included in the MCZ Stage 1 Assessment prior to the DCO application. If not available, it would be incumbent on the applicants of the projects to determine the in-combination effects when they undertake their assessments.

3.17.B.11.43 Although existing built projects are part of the baseline, they have contributed to changes in the MCZ since its designation. Whilst these changes may have been regarded as insignificant at the time, it is recognised that the EGL 4 Project in-combination with the existing changes could hinder the conservation objectives of the MCZ. Given that the conservation objectives are to recover the extent, distribution, structure and function of broadscale habitats, additional permanent habitat loss could hinder these objectives. Of the three broadscale habitats protected within the MCZ, permanent habitat loss could occur within two. No external cable protection is required within subtidal sand habitats and the EGL 4 Project do not route through known areas of ocean quahog. Therefore, there is no potential for an effect of permanent habitat loss alone or in-combination with this broadscale habitat or species. The in-combination assessment therefore focuses on the potential for in-combination effects on subtidal mixed sediment and subtidal coarse sediment.

3.17.B.11.44 Similarly, the objectives of the North Sea glacial tunnel valley are to maintain the extent, component elements and integrity and that the structure and functioning is not impaired, additional permanent habitat loss could also hinder these objectives.

Assessment of In-combination Effects from Permanent Habitat Loss

3.17.B.11.45 A maximum of 0.068 km^2 of permanent habitat loss would be experienced within the MCZ as a result of the EGL 4 Project; 0.041 km^2 within subtidal coarse sediments and 0.027 km^2 within subtidal mixed sediments (noting that the North Sea glacial tunnel valley is also categorised as the feature subtidal mixed sediments, and therefore 0.012 km^2 of cable protection also overlays this feature). As the MCZ covers an area of 1,176 km^2, this is equivalent to 0.005% of the entire MCZ. Given the amount of infrastructure already within the MCZ, any additional habitat loss could hinder the conservation objectives to recover the extent and distribution and the structure and function of broadscale habitats. There is no published information on the current level of anthropogenic habitat loss within the MCZ. **Table 3.17.B–12** provides an estimation based on assumptions.

3.17.B.11.46 It is noted that future use options are currently being considered for the Rough 47/8A to Easington 16 in Gas Line (PL26) (REF 3.17.B.23). As there are currently no publicly available plans for decommissioning or future works, and the infrastructure remains in-situ, the pipeline is included in this in-combination assessment. The Rough AD and AP platform structures will be removed during decommissioning between 2026-2028 (REF 3.17.B.23) and are therefore not considered in this assessment as the habitat will be able to recover once these structures are removed.

Table 3.17.B–12: The Assumed Footprint of Existing Infrastructure Within the MCZ

Infrastructure Name	Status	Data Source	Assumed Footprint
Viking Link Interconnector	Active	KIS-ORCA, (2024, REF 3.17.B.24)	The Viking Link Rock Placement Environmental Impact Assessment (EIA) Screening Assessment (which can be viewed under the MCMS case reference EIA/2020/00050) states that rock berms could be

Infrastructure Name	Status	Data Source	Assumed Footprint
			approximately 6.5 m wide. The worst-case scenario is that throughout the projects lifetime, rock protection would be required along the entire length of the cable route within the MCZ. As the cable route intersects with the MCZ for approximately 17.03 km, the total impacted area could be **0.111 km^2.**
York Platform	Active	NSTA, (2024, REF 3.17.B.25)	Four platforms in total. While the actual impact of habitat loss will be limited to the area of the leg base on the seabed, an average area beneath each platform of 2500 m^2 (i.e., 50 m x 50 m) has been assumed, giving a total impacted area of **0.01 km^2**.
Rough CD Platform			
Rough BP Platform			
Rough BD Platform			
Cres to Mercury tie-in SKID 6in gas pipeline	Active	NSTA, (2024, REF 3.17.B.25)	The data set identified 25 pipelines within the MCZ. However, for these 21 pipelines, there was no information regarding whether the pipelines were buried or surface laid. Therefore, the worst-case scenario has been assumed that the pipelines are surface laid. Collectively, the 21 pipelines intersect the MCZ for approximately 243.17 km. Assuming an average impact zone of 1m (0.5 m either side of the surface pipeline) the total permanent impacted area is indicatively **0.243 km^2**.
Cres Umbilical from Mercury tie-in SKID to Cress Well hydraulic pipeline	Active		
Cleeton CP to Dimlington 36in gas export line	Active		
Rough 47/8A to Easington 16in gas pipeline	Not in use		
Eris to Mercury tit-in SID 6in production pipeline then 10 in production pipeline from Mercury tie-in SKID to Mercury Manifold gas pipelines	Active		
Eris Umbilical from Mercury Manifold to tie-in SKID to Eris Well	Abandoned		
Helvellyn Control Umbilical chemical pipeline	Active		
Helvellyn to A2D gas export pipeline	Active		
Langeled pipeline Sliepner riser to Easington section	Active		

Infrastructure Name	Status	Data Source	Assumed Footprint
Mercury to Neptune 10in gas pipeline	Active		
MH1 to Mercury Manifold in gas pipeline	Active		
MH1 to Mercury Manifold Umbilical	Active		
MH2 to Mercury Manifold 5in gas pipeline	Active		
MH2 to Mercury Manifold Umbilical	Active		
Neptune to Mercury Umbilical	Active		
Rose Control Umbilical from Amethyst A2D Platform to Rose Well	Abandoned		
Rose 10in gas pipeline from Rose Well to Amesthyst A2D platform	Abandoned		
York methanol pipeline from Easington terminal to York platform	Not in use		
York gas production pipeline from York platform to Easington terminal	Active		
Tolmount 20in gas export pipeline	Active		
Tolmount 3in methanol pipeline (piggybacked to 20in gas export)	Active		
Rough 47/3B 26in gas import/export pipeline	Active		Of the 25 pipelines identified within the MCZ, these two pipelines were classified as trenched and buried within the dataset. Collectively, the two pipelines intersect the MCZ for approximately 19.336 km. it is assumed that as they are buried there is no external protection.
Rough 8A to Rough 3B 18in gas export pipeline	Not in use		
West sole to Easington 16in gas pipeline	Active		Of the 25 pipelines identified within the MCZ, these two pipelines were

Infrastructure Name	Status	Data Source	Assumed Footprint
West sole to Easington 24in gas pipeline	Active		classified as surface laid within the dataset. Collectively, the two pipelines intersect the MCZ for approximately 62.625 km. Assuming an average impact zone of 1m (extending 0.5 m either side of the surface pipeline) the total permanent impacted area is indicatively **0.063 km^2**.
Infrastructure crossings			Using GIS, three potential crossings were identified for the existing infrastructure. Two crossings where the Viking Link Interconnector intersects the West Sole to Easington 16in and 24in gas pipelines and one crossing where Cleeton CP to Dimlington 36in gas export line and the Tolmount 20in gas export pipeline and piggybacked 3in methanol pipeline intersect. Assuming that the crossing parameters are similar to that of the EGL 4 Project as outlined in **Table 3.17.B–4** (100 m x 10 m), collectively the total permanent impacted area could be **0.003 km^2**.
Total assumed footprint			0.43 km^2

3.17.B.11.47 The total assumed footprint of existing infrastructure is 0.43 km^2, which is equivalent to 0.037% of the entire MCZ. Therefore, in-combination with the EGL 4 Project, (total area impacted in-combination = 0.498 km^2) 0.042% of the MCZ could be impacted by permanent habitat loss.

3.17.B.11.48 The MCZ was recommended for designation in September 2011 with designation announced in May 2019. The summary of JNCC advice published in November 2016 (REF 3.17.B.26) noted that for both subtidal coarse sediment and subtidal mixed sediments the broadscale habitats were already exposed to oil and gas related infrastructure and due to this exposure and as such in unfavourable condition. The advised target for the features was recover. Of the infrastructure listed in **Table 3.17.B–12,** all with the exception of the Viking Link interconnector and Tolmount 10in gas export and 3in methanol pipelines, were installed prior to the site designation in 2019 and were therefore considered part of the baseline for designation i.e., those areas of broadscale habitat estimated to be within the footprint of the infrastructure were already permanently effected (and as such in unfavourable condition) when the site was designated. This means that the extent of habitat loss between designation and to date can be estimated to be 0.164 km^2; the assumed footprint associated with the Viking Link interconnector (0.111 km^2), Tolmount 10in gas export and 3in methanol pipelines (0.05 km^2) and associated

infrastructure crossings (0.003 km^2). It should be noted that communications with Viking Link have indicated that to date (March 2025) the project has not required the consented quantity of cable protection. Even so, this assessment takes a precautionary approach and assumes that all of the cable protection consented for Viking Link would eventually be installed within the MCZ. In-combination with the EGL 4 Project the footprint of permanent loss since site designation has therefore been estimated to be 0.232 km^2 or 0.0195% of the MCZ**.**

3.17.B.11.49 It has been noted that the MCZ Assessment for Viking Link conducted by the MMO, concluded that the deposit of cable protection within the MCZ was not capable of effecting the features subtidal mixed sediments, or subtidal coarse sediment, providing the mitigation measures were appropriately secured. The mitigation measures secured through the Viking Link Marine Licence are already part of the design of the EGL 4 Project namely:

- Cable protection would be installed only where considered necessary for the safe operation of the EGL 4 Project; and
- Where possible, cable protection materials would be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment will be used as an alternative to terrestrially sourced granite).

3.17.B.11.50 Combined, the EGL 4 Project, Viking Link and other existing developments still cause an insignificant change in the extent of the broadscale habitats within the site. As mentioned above, the habitats present within the Holderness Offshore MCZ that interact with the EGL 4 Project are comprised of mostly gravel and sand, with varying abundances of pebbles, cobbles and boulders. Consequently, these habitats are dominated by sessile macrofauna including Bryozoans (such as the hornwrack (*Flustra foliacea)*), barnacles and anemones (such as the beadlet anemone and the Dahlia anemone). These habitats also host mobile fauna including echinoderms (such as starfish, brittlestars and sea urchins), crustacea (such as crabs and hermit crabs) and fish (such as the common dragonet (*Callionymus lyra)*).

3.17.B.11.51 A review of literature by Wallingford (2025) (REF 3.17.B.10) reports that external rock protection is colonised by primary and secondary users, with amphipods, hydroids and anemones demonstrating colonisation of artificial rock protection within subtidal habitats in the North Sea. Primary colonisers, such as tubeworms and hydroids, initially colonise the artificial rock; these are then displaced between 2 - 4 years later by secondary colonisers, such as anemones, which can dominate the artificial rock for up to 11 years post construction. Additionally, the rock protection provides additional hard substrate for mobile demersal megafauna such as lobsters, crabs and fish. This evidence suggests the introduction of hard substrate may result in increased biodiversity and faunal abundance within the subtidal habitats of the Holderness Offshore MCZ. Some of the sessile species present, such as the beadlet anemone and the Dahlia anemone, may eventually colonise artificial rock structures whilst the crustacea and fish present within the MCZ may utilise the structure for shelter.

3.17.B.11.52 A habitat is defined as "*a place where plants or animals normally live, characterised primarily by its physical features (topography, plant or animal physiognomy, soil characteristics, climate, water quality etc.) and secondarily by the species of plants and animals that live there*" (REF 3.17.B.27). As identified above, where possible, cable protection materials would be selected to match the

environment. Therefore, the addition of cable protection would increase the availability of hard substrate, giving rise to potential increases in biodiversity and abundance of sessile invertebrates and mobile demersal macrofauna already present within the MCZ. The addition of external cable protection will not hinder the ecological function of these habitats by decreasing species abundance.

3.17.B.11.53 Whilst the addition of external cable protection will decrease the availability of soft sediment within the MCZ, displacing any infaunal species within the area, the footprint will be small and will not affect the overall distribution of that sediment within and outside of the MCZ. Additionally, infaunal species are mobile and capable of relocating from areas of external cable protection to softer sediments within the same habitat. Coarse sediments, such as gravel and pebbles, dominate the habitats within the MCZ whilst finer sediments such as mud make up less than 10 % of sediment composition within the EGL 4 Project, further suggesting there will be no adverse impact on habitat function within the MCZ.

3.17.B.11.54 **In conclusion, permanent habitat loss in-combination with existing infrastructure would not hinder the conservation objectives for North Sea glacial tunnel valley, subtidal coarse sediments and subtidal mixed sediments within the MCZ.**

Assessment of In-combination Effects from a Temporary Increase and Deposition of Suspended Sediment

3.17.B.11.55 The EGL 4 Project has the potential to interact with two other projects currently in planning: Hornsea Project Four export cable corridor, and the EGL 3 Project.

3.17.B.11.56 The Hornsea Project Four export cable corridor is situated northwest of the Holderness Offshore MCZ and is located approximately 0.6 km away from the MCZ, at its nearest point (REF 3.17.B.22). The Hornsea Project Four Stage 1 Marine Conservation Zone Assessment (dated August 2021) (REF 3.17.B.28) concluded that for the Holderness Offshore MCZ the temporary increase in suspended sediment concentrations (SSC) and sediment deposition in the offshore export cable corridor would have a slight adverse effect, which is not significant in EIA terms.

3.17.B.11.57 Hornsea Project Four is estimated to finish construction by 2028 (REF 3.17.B.29), whilst the EGL 4 Project is estimated to begin pre-lay and cable trenching activities in 2029. Therefore, there would be no temporal or spatial overlap in construction activities and associated effects between Projects.

3.17.B.11.58 If construction delays were to occur for Hornsea Project Four, overlap between the EGL 4 Project and Hornsea Project Four could occur. This could result in a greater volume of increased SSC and smothering from sediment deposition within the Holderness Offshore MCZ. However, individual Project sediment plumes will not overlap within the MCZ due to the distances between the Projects.

3.17.B.11.59 It is assumed that there will be no delays in construction of Hornsea Project Four and **it is concluded that in-combination with Hornsea Project Four, the EGL 4 Project will not hinder the conservation objectives of the Holderness Offshore MCZ.**

3.17.B.11.60 The EGL 3 Project is situated to the east of and runs parallel to the ELG 4 Project. At its closest point, at the southeast corner of the MCZ, the EGL 3 Project is situated 0.1 km from Holderness Offshore MCZ (**Plate 3.17.B-2**). If pre-lay and

cable trench activities within the EGL 4 Project and the EGL 3 Project occurred simultaneously at this southeast corner of the MCZ, increased suspended sediment concentrations (SSC) would be greater within the Holderness Offshore MCZ compared to if the Projects were constructed sequentially. **Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes** outlines that the maximum distance a fine sediment plume >10 mg/l could travel from trenching activities near this corner of the MCZ is 6.5 km, thus demonstrating the potential for Project fine sediment plumes to overlap. However, this effect will be temporary, with fine sediment in suspension for between five hours and 118 days after trenching activities within the area has finished. However, sediment concentrations will disperse and dilute whilst in suspension, with concentrations reducing to <10 mg/l with distance from the source and time in suspension. The Holderness Offshore MCZ is an unstable, dynamic environment, experiencing moderate wave energy at the seabed (REF 3.17.B.2). **Volume 1, Part 3, Chapter 18: Coastal and Marine Physical Processes** states any exceedances of sediment concentrations >10 mg/l beyond the draft Order Limits will be of short duration in relatively fast tidal flows.

3.17.B.11.61 Adjacent to the northeast corner of the MCZ , an area of sandwaves has been identified within the EGL 3 Project and EGL 4 Project that may require pre-sweeping during construction.

3.17.B.11.62 For the effect of pre sweeping within the EGL 3 Project on the Holderness Offshore MCZ, **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** concluded:

- all sediment coarser than fine sand will settle within the EGL 3 Project and therefore won't affect the MCZ; and
- any deposition of fine sediment within the MCZ from TSHD activities will be <2 mm, which will not be distinguishable from natural background levels.

3.17.B.11.63 If the EGL 3 Project and EGL 4 Project were constructed simultaneously, sediment deposition plumes within the MCZ could overlap. However, given the thin deposition thickness predicted to occur from pre-sweeping within the EGL 3 Project, <2 mm of fine sediment will have no additional discernible effect on the structure, function, or quality of habitats within the MCZ. The moderate wave energy that is known to occur at the seabed within the Holderness Offshore MCZ (REF 3.17.B.2) is likely to remove all light smothering (<5 cm) from sediment deposition.

3.17.B.11.64 Therefore, temporary increases in SSC >10 mg/l and smothering from sediment deposition within the Holderness Offshore MCZ will not hinder the conservation objectives in the MCZ when considered in-combination with other Projects. **It is concluded that in-combination with the EGL 3 Project, the EGL 4 Project will not hinder the conservation objectives of the Holderness Offshore MCZ.**

3.17.B.12 Northeast of Farnes Deep HPMA

3.17.B.12.1 The NEFD HPMA is located approximately 0.5 km away from the EGL 4 Project. As summarised in

3.17.B.12.2 **Table 3.17.B**–2, the initial screening identified a source-pathway-receptor between five key important marine mammal species and the impact of underwater noise changes. However, **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** of the PEIR concluded that the EGL 4 Project will not have a significant effect on individuals outside of the NEFD HPMA during any phase of development. Therefore, the Stage 1 Assessment only considers the effects on marine mammals within the HPMA.

Site Description

3.17.B.12.3 The NEFD HPMA was designated in June 2023 and overlaps entirely with the NEFD MCZ, however they remain as two distinct designations. HPMAs extend protection to the entire marine ecosystem (seabed, water column, processes and all species) within the site. The NEFD HPMA is located approximately 55 km offshore from the north Northumberland Coast, in the northern North Sea covering an area of 492 km^2 and ranges in depth from 50-100 m below chart datum. The seabed within the NEFD HPMA is a mix of highly mosaiced habitats, ranging from coarse sediments through to mixed sediments and mud. These are relatively stable habitats, which support a diverse range of marine flora and fauna such as anemones, worms, molluscs, echinoderms and fish species. These habitats also support birds and marine mammals, with at least seven nationally important seabird species and five marine mammal species recorded within the area. Large areas of muddy habitats cover 27 km^2 of the NEFD HPMA (equivalent to 5% of the site) and are thought to be important for the storage of carbon. At present, this is the only offshore HPMA with blue carbon habitats.

3.17.B.12.4 JNCC and NE (2022) (REF 3.17.B.30) notes that data sets from the Sea Mammal Research Unit (SMRU 2015 cited in the reference) and the Joint Cetacean Protocol (JCP 2017 cited in the reference) identified a relatively greater presence of five marine mammal species in this area in comparison to the wider region. These were harbour porpoise (*Phocoena phocoena*); minke whale (*Balaenoptera acutorostrata*); white-beaked dolphin (*Lagenorhynchus albirostris*); grey seal (*Halichoerus grypus*); and harbour seal (*Phoca vitulina*).

Conservation Objectives

3.17.B.12.5 The conservation objective for the site is to:

- Achieve full recovery of the protected feature, including its structure and functions, its qualities and the composition of its characteristic biological communities present within the Northeast of Farnes Deep Highly Protected Marine Area, to a natural state, and
- Prevent further degradation and damage to the protected feature, subject to natural change.

3.17.B.12.6 Such that within the site:

- The ecosystem is allowed to fully recover in the absence of damaging activities such that:
  - The ecosystem structure consists of a diverse range of benthic and pelagic communities, habitats and species, including biotic and abiotic components of the ecosystem. These fulfil a variety of functional roles,

including supporting key life cycle stages and/or behaviours of marine species.

  - The physical, biological and chemical ecosystem processes and functions proceed unhindered, so that the site realises its full ecological potential to deliver goods and services, including habitats and species considered important to the long-term storage of carbon.

  - The ecosystem is resilient to change and stressors.

- Any ecosystem changes brought about by the process of removing anthropogenic impacts should be considered in the context of a naturally recovering ecosystem.

- The NEFD HPMA supports our understanding of how marine ecosystems change and recover in the absence of impacting activities.

3.17.B.12.7 Note that this does not prevent human intervention to enable or facilitate recovery or the prevention of degradation or damage.

Relevant EGL 4 Project Activities

3.17.B.12.8 The relevant activities which could cause the impact of 'underwater noise changes' are the presence of project vessels (and equipment) and geophysical surveys. These activities will be restricted to within the draft Order Limits, outside of the HPMA. It should be noted that as the EGL 4 Project lie outside of the 12 NM limit where it is in proximity to the HPMA. The activities assessed here are therefore exempt from requiring a Deemed Marine Licence. The assessment has been provided to enable a holistic overview of the potential impact of the EGL 4 Project to be reached and as a matter of best practice.

3.17.B.12.9 It is important to note that UXO clearance is not being consented under the DCO; a separate Marine Licence would be applied for, if required. Therefore, underwater noise associated with the clearance of UXO is not considered in the Stage 1 Assessment.

3.17.B.12.10 JNCC (2020) (REF 3.17.B.31) recommend a 5 km effective deterrent range (EDR) for geophysical surveys for very high frequency cetaceans such as harbour porpoise and as such, this was used as a proxy for determining the ZOI for all marine mammal species. This assessment has also drawn upon the underwater noise modelling undertaken to inform the English Offshore Scheme presented in **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment.**

Relevant Mitigation

3.17.B.12.11 Geophysical surveys conducted during construction, operation and decommissioning, would use several sonar-like survey types e.g., multi-beam echosounder (MBES), side scan sonar (SSS), sub-bottom profiler (SBP) and USBL (ultra short baseline). It is best practice to follow the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from geophysical surveys (REF 3.17.B.32) (or as subsequently updated). Adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Implementation of the guidance would be secured through the Construction Environmental Management Plan.

3.17.B.12.12 The JNCC guidelines state that MBES surveys in shallow waters (<200 m) use higher frequencies that typically fall outside the hearing frequencies of cetaceans and that the sounds produced are likely to attenuate more quickly than the lower frequencies used in deeper waters. JNCC do not, therefore, advise that mitigation is required for MBES surveys in shallow waters. SSS equipment is similar and therefore, mitigation is not required for these surveys in shallow waters. The NEFD HPMA is between 50-100 m below chart datum and the EGL 4 geophysical survey identified that the EGL 4 draft Order Limits adjacent to the NEFD HPMA are <200 m. Therefore, mitigation is not required for MBES or SSS surveys.

3.17.B.12.13 No mitigation is proposed for the use of USBL; a positioning system and positioning transponders used to monitor the position of towed survey equipment.

3.17.B.12.14 The mitigation for SBP surveys would include the following:

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

Assessment

3.17.B.12.15 Underwater noise propagation modelling has been undertaken for the EGL 4 Project. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** provides a summary of acoustic concepts and terminology, acoustic assessment criteria, estimated source noise levels and provides the approach taken and results of the underwater noise propagation modelling. The report uses sound propagation models to calculate the impact ranges of auditory injury (i.e. Permanent Threshold Shifts (PTS) in hearing) and disturbance (i.e. behavioural response to the onset of a Temporary Threshold Shits (TTS) in hearing) to marine mammals from each phase of the English Offshore Scheme for key modelled sources:

- Geophysical surveys – non-impulsive sound sources; and
- Vessels and equipment – non-impulsive sound sources.

3.17.B.12.16 Marine mammals are not equally sensitive to noise at all frequencies and have different hearing sensitivity thresholds. The underwater noise propagation modelling calculates the received noise level at different distances from the source. To determine the potential consequences of these received levels on any marine mammals, it is necessary to relate the levels to known or estimated potential impact thresholds. The injury and disturbance thresholds proposed by Southall *et al*., (2019) (REF 3.17.B.33) and NMFS, (2024) (REF 3.17.B.34) are the latest peer reviewed criteria and have been used in this assessment. These are described and explained in **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment**. The approach separates marine mammals into groups based on their functional hearing i.e. the frequency characteristics (bandwidth and noise level) within which acoustic signals can be perceived and therefore are assumed to have auditory effects. The five important marine mammal species 'screened in' to the Stage 1 Assessment belong to the following functional hearing groups according to NMFS, (2024) (REF 3.17.B.34):

- Harbour porpoise: Very High Frequency (VHF) cetaceans which have a generalised hearing range of 200 Hz - 165 kHz
- White-beaked dolphin: High Frequency (HF) cetaceans which have a generalised hearing range of 150 Hz - 160 kHz
- Minke whale: Low Frequency (LF) cetaceans which have a generalised hearing range of 7 Hz - 36 kHz
- Harbour seal and grey seal: Phocid Carnivores in Water (PCW): true seals which have a generalised hearing range of 40 Hz - 90 kHz in water

3.17.B.12.17 The following assessments assess the risk of injury and disturbance as a result of underwater noise from geophysical surveys and vessels and equipment for each of the functional hearing groups.

VHF Cetaceans: Harbour Porpoise

3.17.B.12.18 Harbour porpoise are one of the five important marine mammal species 'screened in' to the Stage 1 Assessment and are classed as VHF cetaceans. It is known that the NEFD HPMA is used by harbour porpoise (REF 3.17.B.30) and the site is located within the wider North Sea Management Unit (MU) for the species (REF 3.17.B.35). Large scale surveys to monitor cetacean population size have been carried out in UK waters. The most recent survey by Small Cetacean in European Atlantic Waters and North Sea (SCAN) was completed in 2022 (SCANS IV) and the results were reported by Gilles *et al*., (2022) (REF 3.17.B.36). This survey provides the most recent density estimates for the region. The NEFD HPMA lies within Block NS-D. The harbour porpoise density estimate for the block was 0.5985 individuals per km^2, suggesting that 295 animals could be present within the HPMA, although given the highly mobile nature of the species this is likely to be conservative as group sizes are typically small (1-3 animals). Densities are highest during summer months with animals moving further south during winter.

3.17.B.12.19 The full assessment of underwater noise changes on VHF cetaceans can be seen in **Table 3.17.B–13**.

Table 3.17.B–13: Assessment of Underwater Noise Changes on Harbour Porpoise in the Northeast of Farnes Deep HPMA

Impact	Evidence
Geophysical surveys	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that, the maximum potential impact range of a PTS on VHF cetaceans as a result of geophysical surveys using a SBP is 150-195m. However, the directionality of the beam significantly reduces the potential for injury. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, VHF cetaceans within the NEFD HPMA will not be within range for injury as a result of a PTS. However, it does indicate that mitigation would be required to ensure animals are not within 500 m of the source when the device is switched on to reduce the likelihood of impacts. The most likely response of a marine mammal to sound levels that could induce auditory injury is to flee from the ensonified area (REF 3.17.B.37). There is evidence that cetaceans exhibit short-term behavioural responses to geophysical surveys e.g., REF 3.17.B.38, REF 3.17.B.37, REF 3.17.B.39 and REF 3.17.B.40). Subsequently the onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area. In addition, the mitigation outlined in **Paragraph 3.17.B.12.14** will be applied when using a SBP which will reduce the risk of injury occurring from the SBP systems.
Disturbance	The NEFD is 0.5 km away from the EGL 4 Project and is therefore within JNCCs recommended 5 km EDR for harbour porpoise for geophysical surveys (REF 3.17.B.31). According to guidance from the JNCC (2020) (REF 3.17.B.31), noise disturbance is considered significant in relation to Special Areas of Conservation if it causes the exclusion of harbour porpoises from more than: • 20% of the relevant area of the site in any given day, or • an average of 10% of the relevant area of the site over the season. This guidance is applied in this assessment to evaluate the potential impact of underwater noise on harbour porpoise within the HPMA. Since the EGL 4 Project runs parallel to, rather than intersecting with, the HPMA, the consideration of underwater noise is limited to a 5 km radius from one side of the source, as opposed to 5 km either side. The 5 km EDR could overlap with the NEFD HPMA (which spans an area of 492 km^2), for a maximum of 103.6 km^2 as the survey runs parallel to the site for approximately 36 km, which is equivalent to 21.1% of the entire HPMA. Geophysical surveys typically operate at speeds of 7.5 km/hr (4 knots). The survey would take between 5 and 15 hours to complete (assuming between one and three survey lines were run). During this period, the zone of disturbance would move with the vessel, meaning that at any one time a maximum of 40 km^2 of the site is affected (8.13% of the site). Consequently, up to 24 animals within the NEFD HPMA could be briefly displaced at any one time, with an estimated total of 62 animals temporarily displaced over the course of the survey. However, it is important to note that these are likely to be highly

Impact	Evidence
	conservative estimates. Gilles *et al*., (2022) (REF 3.17.B.36) reported an estimate porpoise abundance of 338,918 individuals the North Sea Assessment Unit, which overlaps entirely with the North Sea MU. Therefore, the displacement of 62 individuals represents only 0.018% of the wider population within the North Sea and will not affect the favourable conservation status of the species. As explained above for the assessment of injury, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to actively avoid injury by moving away from the area to alternative foraging areas. However, the geophysical surveys are temporary and transient and animals are able to return to the impacted area as soon as the vessel passes through; as evidenced by observations following a 2D seismic survey in the Moray Firth, where harbour porpoise returned to the area within 19 hours of survey stopping (REF 3.17.B.39). Whilst it is acknowledged that the threshold for significant disturbance would be exceed in a day, there is suitable alternative habitat available whilst animals are displaced. Furthermore, the survey would be limited in duration to one day and animals would be able to return within a brief period of time. Disturbance will therefore fit under the JNCC *et al*., (2010) (REF 3.17.B.41) classification of trivial as it will only lead to *"sporadic disturbances without any likely negative impact on the species".*
Vessels and equipment	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for impacts for a PTS. Therefore, there is no source-pathway-receptor at any stage of the development for HF cetaceans
Disturbance	As explained above for the assessment of injury from geophysical surveys, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to actively avoid injury by moving away from the area. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum potential range for a TTS from the EGL 4 Project is 12m from survey and construction support vessels and 33-118 m from a TSHD or rock placement vessel. However, the NEFD HPMA is not within a location identified as potentially requiring pre-sweeping and therefore a TSHD will not be used. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, HF cetaceans within the NEFD HPMA will not be within range for disturbance to occur and would not be displaced from within the site. Furthermore, vessels and construction noise will be temporary and transitory, as opposed to permanent and fixed. In this respect, construction noise is unlikely to differ significantly from vessel traffic already in the area. Animals within the North Sea are subject to high levels of shipping traffic with vessel density in some areas exceeding 100 hours/km^2 per month in 2023 (REF 3.17.B.42). This suggests that animals within the HPMA will already be habituated to vessel movements and the associated underwater noise. Disturbance will therefore fit under the JNCC *et al*., (2010) (REF 3.17.B.41) classification of trivial as it will only lead to *"sporadic disturbances without any likely negative impact on the species".*

Impact	Evidence
Conclusion	
	With the implementation of industry standard mitigation for SBP, there is no potential for lethal, physical or auditory injury effects on harbour porpoise. There is the potential for disturbance of animals from the operation of the SBP equipment. Due to the short distance that the EGL 4 Project runs parallel to the NEFD HPMA, the short duration of the works on each occasion and the fact that any displacement would be temporary (with suitable alternative habitat available in the wider region), the potential to cause disturbance is deemed negligible and it will not affect the favourable conservation status of the species. Furthermore, there is no potential for disturbance, lethal, physical or auditory injury effects on harbour porpoise from the presence and use of the EGL 4 Project vessels and equipment. **Therefore, the impact of underwater noise changes is deemed not significant for harbour porpoise. The EGL 4 Project will not hinder the conservation objectives of achieving full recovery and to prevent further degradation and damage to the entire ecosystem of the area.**

HF Cetaceans: White-beaked dolphin

3.17.B.12.20 White-beaked dolphin are classified as a HF cetacean. It is known that the NEFD HPMA is used by white-beaked dolphin (REF 3.17.B.30) and the site is located within the wider Celtic and Greater North Seas Management Unit (MU) for the species (REF, 35). The SCANS IV survey estimated a density of 0.0799 animals per km^2 for Block NS-D, suggesting that 39 animals could be present within the NEFD HPMA.

3.17.B.12.21 The full assessment of underwater noise changes on HF cetaceans can be seen in **Table 3.17.B–14**.

Table 3.17.B–14: Assessment of Underwater Noise Changes on White-beaked Dolphin in the Northeast of Farnes Deep HPMA

Impact	Evidence
Geophysical surveys	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum potential impact range of a PTS on for HF cetaceans as a result of geophysical surveys using a SBP is 43-100 m. However, the directionality of the beam significantly reduces the potential for injury. The NEFD HPMA is 0.5 km away from the EGL 4 Project, HF cetaceans within the NEFD HPMA will not be within range for injury as a result of a PTS. In addition, mitigation will be implemented for VHF cetaceans for the use of SBP as determined in **Table 3.17.B–13**. As part of the mitigation outlined in **Paragraph 3.17.B.12.14**, if a marine mammal is observed within a 500 m mitigation zone around the acoustic source, the survey will be delayed until 20 minutes after the marine mammal has left the mitigation zone. This will further reduce the likelihood of injury as a result of SBP on HF cetaceans.

Impact	Evidence
	Furthermore, the most likely response of a marine mammal to noise levels that could induce auditory injury is to flee from the ensonified area (REF 3.17.B.37). There is evidence that cetaceans exhibit short-term behavioural responses to geophysical surveys e.g., REF 3.17.B.38, REF 3.17.B.37, REF 3.17.B.39, and REF 3.17.B. Subsequently the onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area.
Disturbance	As explained above for the assessment of injury, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to actively avoid injury by moving away from the area. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum range at which TTS could occur for HF cetaceans as a result of geophysical surveys using a SBP is 115-165 m. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, HF cetaceans within the NEFD HPMA will not be within range for disturbance to occur and would not be displaced within the site.
Vessels and equipment	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a PTS in HF cetaceans. Therefore, there is no source-pathway-receptor at any stage of the development for HF cetaceans.
Disturbance	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a TTS in HF cetaceans. Therefore, there is no source-pathway-receptor at any stage of the development for HF cetaceans.
Conclusion	
The maximum potential impact range of the EGL 4 Project activities is for geophysical surveys. A PTS in hearing could be experienced within 43-100 m of a SBP, whilst a TTS could be experienced within 115-165 m of A SBP. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, HF cetaceans within the NEFD HPMA will not be within range for injury to occur as a result of geophysical surveys for the EGL 4 Project. Furthermore, noise levels from the EGL 4 Project vessels and equipment types does not exceed the threshold for a PTS or a TTS in HF cetaceans. As a result, there is no potential for injury or disturbance of HF cetaceans within the NEFD HPMA as a result of underwater noise changes from the EGL 4 Project. **The impact of underwater noise changes is deemed not significant for white-beaked dolphin, the EGL 4 Project will not hinder the conservation objectives of achieving full recovery and to prevent further degradation and damage to the entire ecosystem of the area.**	

LF Cetaceans: Minke Whale

3.17.B.12.22 Minke whale are classed as a LF cetacean. It is known that the NEFD HPMA is used by minke whale (REF 3.17.B.30) and the site is located within the wider Celtic and Greater North Seas Management Unit (MU) for the species (REF 3.17.B.35). The SCANS IV survey estimated a density of 0.0419 animals per km^2

for Block NS-D, suggesting that 21 animals could be present within the NEFD HPMA.

3.17.B.12.23 The full assessment of underwater noise changes on LF cetaceans can be seen in **Table 3.17.B–15**.

Table 3.17.B–15: Assessment of Underwater Noise Changes on Low Frequency Cetaceans in the Northeast of Farnes Deep HPMA

Impact	Evidence
Geophysical surveys	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum potential impact range for a PTS for LF cetaceans as a result of geophysical surveys using a SBP is 15-41 m. However, the directionality of the beam significantly reduces the potential for injury. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, LF cetaceans within the NEFD HPMA will not be within range for injury to occur as a result of project activities. Furthermore, mitigation will be implemented for VHF cetaceans for the use of SBP as determined in **Table 3.17.B–13**. As part of the mitigation outlined in **Paragraph 3.17.B.12.14**, if a marine mammal is observed within a 500 m mitigation zone around the acoustic source, the survey will be delayed until 20 minutes after the marine mammal has left the mitigation zone. This will further reduce the likelihood of injury as a result of SBP on LF cetaceans. The most likely response of a marine mammal to noise levels that could induce auditory injury is to flee from the ensonified area (REF 3.17.B.37). There is evidence that cetaceans exhibit short-term behavioural responses to geophysical surveys e.g., REF 3.17.B.38, REF 3.17.B.37, REF 3.17.B.39, and REF 3.17.B. 40. Subsequently the onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area.
Disturbance	As explained above for the assessment of injury, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to actively avoid injury by moving away from the area. However, **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum range at which TTS could occur for LF cetaceans as a result of geophysical surveys is 41-90 m when a SBP is used. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, HF cetaceans within the NEFD HPMA will not be within range for disturbance and would not be displaced within the site.
Vessels and equipment	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a PTS in LF cetaceans. Therefore, there is no source-pathway-receptor at any stage of the development on LF cetaceans.*et al*the

Impact	Evidence
Disturbance	As explained above for the assessment of injury for geophysical surveys, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to move away from the area. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a TTS in LF cetaceans. Therefore, there is no source-pathway-receptor at any stage of the development on LF cetaceans.
Conclusion	
The maximum potential impact range of the EGL 4 Project activities is for geophysical surveys. A PTS in hearing could be experienced within 15-41 m of a SBP, whilst a TTS could be experienced within 41-90 m of a SBP.As the NEFD HPMA is 0.5 km away from the EGL 4 Project, LF cetaceans within the NEFD HPMA will not be within range for injury to occur as a result of geophysical surveys for the EGL 4 Project. Furthermore, noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a PTS or a TTS. As a result, there is no potential for injury or disturbance of LF cetaceans within the NEFD HPMA as a result of underwater noise changes from the EGL 4 Project. **The impact of underwater noise changes is deemed not significant for minke whale. The EGL 4 Project will not hinder the conservation objectives of achieving full recovery and to prevent further degradation and damage to the entire ecosystem of the area.**	

PCW: Harbour Seal and Grey Seal

3.17.B.12.24 Harbour seal and grey seal are classed as PCW. It is known that the NEFD HPMA is used by both seal species (REF 3.17.B.30) and the site is located within the wider Northeast England seal MU (REF 3.17.B.43). The mean percentage of at-sea population for grey seal is <0.009% per 25 km^2 within the site, whilst for grey seal it is <0.001% per 25 km^2, indicating numbers present will be low.

3.17.B.12.25 The full assessment of underwater noise changes on PCW can be seen in **Table 3.17.B–16**.

Table 3.17.B–16: Assessment of Underwater Noise Changes on Phocid Carnivores in Water in the Northeast of Farnes Deep HPMA

Impact	Evidence
Geophysical surveys	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum potential impact range for a PTS for PCW as a result of geophysical surveys using a SBP is 41-99 m. However, the directionality of the beam significantly reduces the potential for injury. As the NEFD HPMA is 0.5 km away from the EGL 4 draft Order Limits, PCW within the NEFD HPMA will not be within range for a PTS to occur as a result of project activities. Furthermore, mitigation will be implemented for VHF cetaceans for the use of SBP as determined in

Impact	Evidence
	Table 3.17.B–13. As part of the mitigation outlined in **Paragraph 3.17.B.12.14** if a marine mammal is observed within a 500 m mitigation zone around the acoustic source, the survey will be delayed until 20 minutes after the marine mammal has left the mitigation zone. This will further reduce the likelihood of injury as a result of SBP on PCW. The most likely response of a marine mammal to noise levels that could induce auditory injury is to flee from the ensonified area (REF 3.17.B.37). There is evidence that seals exhibit short-term behavioural responses to geophysical surveys e.g., REF 3.17.B.44 and REF 3.17.B.45. Subsequently the onset of TTS can be referred to as the fleeing response. This is therefore a behavioural response that overlaps with disturbance ranges and animals exposed to these noise levels are likely to actively avoid hearing damage by moving away from the area
Disturbance	As explained above for the assessment of injury, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to actively avoid injury as a result of a PTS by moving away from the area. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that the maximum potential impact range for a TTS for PCW as a result of geophysical surveys using a SBP is 43-100 m. As the NEFD HPMA is 0.5 km away from the EGL 4 Project, seals within the NEFD HPMA will not be within range for a TTS to occur as a result of geophysical surveys.
Vessels and equipment	
Injury	**Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for impacts for a PTS in PCW. Therefore, there is no source-pathway-receptor at any stage of the development on PCW.
Disturbance	As explained above for the assessment of injury, the onset of a TTS can be referred to as the fleeing response. This is therefore a behavioural response, and animals exposed to these noise levels are likely to move away from the area. **Volume 2, Part 3, Appendix 3.22.A: Underwater Noise Assessment** indicates that noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for impacts for a TTS in PCW. Therefore, there is no source-pathway-receptor at any stage of the development on PCW.
Conclusion	
The maximum potential impact range of the EGL 4 Project activities is for geophysical surveys. A PTS in hearing could be experienced within 41-99 m of the source, whilst a TTS could be experienced within 43-100 m of the source. Furthermore, noise levels from the EGL 4 Project vessels and equipment will not exceed the threshold for a PTS or a TTS. As a result, there is no potential for injury or disturbance to occur as a result of underwater noise changes from the EGL 4 Project. **The impact of underwater noise changes is deemed not significant for harbour seal and grey seal. The EGL 4 Project will not hinder the conservation objectives of achieving full recovery and to prevent further degradation and damage to the entire ecosystem of the area.**	

In-combination Effects

3.17.B.12.26 If other plans or projects are under construction at the same time as the EGL 4 Project, there could be an in-combination effect for the impact of changes in underwater noise. **Volume 2, Part 3, Appendix 3.17.A: Marine Conservation Zone (MCZ) Assessment Screening** of the PEIR identified two other subsea cable projects currently in planning within 5 km of the HPMA:

- Morvern Hawthorn Pit Grid Connection Project
- Eastern Green Link 2

3.17.B.12.27 The exact route of the Morven Hawthorn Pit Grid Connection Project has not yet been confirmed; therefore, this assessment considers the worst-case scenario, assuming the cable route runs along the eastern boundary of the NEFD HPMA for its entire length (25.1 km) and the Eastern Green Link 2 project is located approximately 3.1 km from The assessment also assumes that given they are analogous projects to the EGL 4 Project, they will have the same potential impact ranges for injury and disturbance effects for geophysical surveys, vessels and other equipment.

3.17.B.12.28 With respect to HF cetaceans, LF cetaceans and PCW, given the distances to the NEFD HPMA, the EGL 4 Project is not within range for injury of disturbance to occur within the NEFD HPMA. Therefore, there is no potential for an in-combination effect on HF and LF cetaceans and PCW within the HPMA. **It is concluded that there is no potential for an in-combination effect for white-beaked dolphin, minke whale, harbour seal and grey seal.**

3.17.B.12.29 With respect to VHF cetaceans, given the distances to the NEFD HPMA, the EGL 4 Project is not within range for injury of disturbance to occur within the site boundaries from the EGL 4 Project vessels and equipment. The EGL 4 Project is also not within range for an injury to occur as a result of geophysical surveys using a SBP. Therefore, there is no potential for an in-combination effect on VHF cetaceans within the NEFD HPMA. **It is concluded that there is no potential for an in-combination effect on harbour porpoise as a result of vessels and equipment, or the potential for an in-combination injury effect from geophysical surveys.**

3.17.B.12.30 The JNCC, (2020) (REF 3.17.B.31) recommend a 5 km EDR for assessing the disturbance of harbour porpoise for geophysical surveys. Given that the two other projects identified are within 5 km of the NEFD HPMA and that the EGL 4 Project alone could exceed the JNCC, (2020) (REF 3.17.B.31) threshold for the exclusion of harbour porpoises from more than 20% of the relevant area of the site in any given day, there is also the potential for an in-combination effect. The full assessment is presented below.

Assessment of In-combination Effects on Harbour Porpoise from Geophysical Surveys using a Sub-bottom Profiler

3.17.B.12.31 The Morven Hawthorn Pit Grid Connection Project runs parallel to the NEFD HPMA, so underwater noise is considered only within a 5 km radius from one side of the source. Assuming the cable route runs along the eastern boundary for 25.1 km, the 5 km EDR could overlap with the NEFD HPMA for a maximum of 125.5 km^2. Given that the NEFD HPMA spans an area of 492 km^2, this could potentially affect up to 25.5% of the entire NEFD HPMA. The EGL 4 Project alone could impact up to 21.1% of the NEFD HPMA on a given day, and in-combination, the

projects could affect up to 46.5%. Although unlikely that project activities will take place at the same time near the NEFD HPMA, if they do converge, this could potentially exceed the JNCC threshold of the exclusion of harbour porpoises from more than 20% of the relevant area in any given day (REF 3.17.B.31). Both projects would need to adhere to the daily thresholds separately. In addition, collaboration between the projects will be required to ensure that daily thresholds are not exceeded in-combination or to avoid overlapping schedules near the NEFD HPMA. It is concluded that with collaboration (e.g. coordinating surveys so that they do not occur on the same day), there will be no significant in-combination effects on harbour porpoise disturbance from underwater noise.

3.17.B.12.32 The Eastern Green Link 2 Project runs parallel to the NEFD HPMA, so underwater noise is considered only within a 5 km radius from one side of the source. Given that the cable route is located approximately 3.1 km from the NEFD HPMA and the overlap from the 5 km EDR could cover an area of approximately 4.9 km^2 and that the NEFD HPMA spans an area of 492 km^2, the 5 km EDR could potentially affect up to 1% of the entire NEFD HPMA. However, the overlap from Eastern Green Link 2 is in the same location as the overlap from the EGL 4 Project, but to a lesser extent. Therefore, in-combination these projects will not increase the area of the NEFD HPMA that harbour porpoise could be disturbed by noise. **Therefore, it is considered that there will be no significant in-combination effects with Eastern Green Link 2 and the EGL 4 Project for the disturbance of harbour porpoise as a result of the impact of underwater noise changes.**

3.17.B.12.33 In conclusion, there will be no significant in-combination effects with the Eastern Green Link 2 Project with the EGL 4 Project. Providing that the EGL 4 Project and the Morvern Hawthorn Pit Grid Connection Project collaborate to ensure that daily thresholds are not exceeded in-combination, or to avoid overlapping schedules near the NEFD HPMA there will be no significant in-combination effect. **Therefore, there is no potential for in-combination effects to hinder the conservation objectives of the NEFD HPMA.**

3.17.B.13 Stage 1 Conclusion

3.17.B.13.1 The impacts of temporary habitat loss/seabed disturbance, permanent habitat loss, water flow changes and temporary increase and deposition of suspended sediments, as a result of the EGL 4 Project, were assessed against the conservation objectives for the Holderness Offshore MCZ. This assessment concludes that there is no significant risk of these impacts, in-isolation or in-combination with other planned projects within/surrounding the MCZ, of hindering the achievement of the conservation objectives stated and a Stage 2 MCZ Assessment will not be required.

3.17.B.13.2 The impact of underwater noise from the EGL 4 Project was evaluated against the conservation objectives for the NEFD HPMA. The assessment concludes that there is no significant risk, either in-isolation or in combination with other projects or plans, of hindering the achievement of these objectives. Therefore, a Stage 2 MCZ Assessment will not be required.

3.17.B.13.3 The assessment conclusions for each protected feature within the Holderness Offshore MCZ and NEFD HPMA is summarised in **Table 3.17.B–17.**

Table 3.17.B–17: Summary of the Stage 1 MCZ Assessment Conclusions

Site Name	Protected Feature	Potential Impact	Assessment Conclusion
Holderness Offshore MCZ	North Sea glacial tunnel valley Subtidal coarse sediments Subtidal mixed sediments Subtidal sand Ocean quahog	▪ Temporary habitat loss/seabed disturbance ▪ Permanent habitat loss ▪ Water flow (tidal current) changes, including sediment transport considerations	The EGL 4 Project will not hinder the conservation objectives of this Protected Feature alone or in-combination with other Projects
	Subtidal coarse sediments Subtidal mixed sediments Subtidal sand	▪ Temporary increase and deposition of suspended sediments	The EGL 4 Project will not hinder the conservation objectives of this Protected Feature alone or in-combination with other Projects
Northeast of Farnes Deep HPMA	Harbour porpoise White-beaked dolphin Minke whale Harbour seal Grey seal	▪ Underwater noise changes	The EGL 4 Project will not hinder the conservation objectives of this Protected Feature alone or in-

Site Name	Protected Feature	Potential Impact	Assessment Conclusion
			combination with other Projects.

Bibliography

Ref. 3.17.B.1 JNCC (2024). Holderness Offshore MPA. Available at: https://jncc.gov.uk/our-work/holderness-offshore-mpa/. [Accessed 16/04/25]

Ref. 3.17.B.2 JNCC (2021). Supplementary Advice on Conservation Objectives for Holderness Offshore MCZ. Available at: https://data.jncc.gov.uk/data/d439f5d1-5440-4547-84fb-8bd6ec970e44/HoldernessOffshore-SACO-V1.0.pdf. [Accessed 16/04/25]

Ref. 3.17.B.3 JNCC (2022). Marine Pressures-Activities Database (PAD) v1.5. Available at: https://hub.jncc.gov.uk/assets/97447f16-9f38-49ff-a3af-56d437fd1951#:~:text=5%202022&text=Coastal%20and%20marine%20ecosystems%20are,the%20evidence%20behind%20such%20links. [Accessed 16/04/25]

Ref. 3.17.B.4 ABPmer (2024). IFA 2000 cable protection, Coastal Process Assessment, ABPmer Report No. R.4698. A report produced by ABPmer for CEA

Ref. 3.17.B.5 Kirkham, J.D., Hogan, K. A., Larter, R.D., Self, E., Games, K., Huuse, M., Stewart, M. A., Ottesen, D., Le Heron, D. P., Lawrence, A., Kane, I., Arnold, N. S, and Dowdeswell, J. A. (2024) 'The infill of tunnel valleys in the Central North Sea: Implications for sedimentary processes, geohazards, and ice-sheet dynamics', Marine Geology, 467. doi:10.1016/j.margeo.2023.107185.

Ref. 3.17.B.6 Pearce B., Tappin, D. R., Dove, D., Pinnion, J. (2012) 'Benthos supported by the tunnel-valleys of the southern North Sea' In: Seafloor Geomorphology as Benthic Habitat. Elsevier. Pp. 597-612.

Ref. 3.17.B.7 European Marine Observation and Data Network (EMODnet) (2023). Seabed Habitats. Available at: https://emodnet.ec.europa.eu/en/seabed-habitats. [Accessed 16/04/25]

Ref. 3.17.B.8 Benthic Solutions (2025) Appendix U: Subtidal Camera Transect Log Sheets. Eastern Green Link 4 English Environmental Baseline Survey

Ref. 3.17.B.9 Tillin, H.M. & Watson, A., 2023. Glycera lapidum, Thyasira spp. and Amythasides macroglossus in offshore gravelly sand. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 24-03-2025]. Available at: https://www.marlin.ac.uk/habitats/detail/1136/glycera_lapidum_thyasira_spp_and_amythasides_macroglossus_in_offshore_gravelly_sand

Ref. 3.17.B.10 Wallingford, H. R. (2025) Design Guidance. Seabed Stabilisation and Scour Mitigation

Ref. 3.17.B.11 JNCC (2019). Subtidal Coarse sediment. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20190307234505/http:/jncc.defra.gov.uk/page-5801. [Accessed 16/04/25]

Ref. 3.17.B.12 Readman, J.A.J., & Watson, A., 2024. Flustra foliacea and Hydrallmania falcata on tide-swept circalittoral mixed sediment. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine

Biological Association of the United Kingdom. [cited 24-03-2025]. Available at: https://www.marlin.ac.uk/habitats/detail/74/flustra_foliacea_and_hydrallmania_falcata_on_tide-swept_circalittoral_mixed_sediment

Ref. 3.17.B.13 Readman, J.A.J.,, Lloyd, K.A., & Watson, A., 2023. Bryozoan turf and erect sponges on tide-swept circalittoral rock. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [online]. Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitats/detail/9/bryozoan_turf_and_erect_sponges_on_tide-swept_circalittoral_rock [Accessed 16/04/25]

Ref. 3.17.B.14 JNCC (2019). Subtidal mixed sediments. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20190307234454/http:/jncc.defra.gov.uk/page-5800. [Accessed 16/04/25]

Ref. 3.17.B.15 Irving, R. 2009. The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008. JNCC Report No. 432 Available at: https://data.jncc.gov.uk/data/21693da5-7f59-47ec-b0c1-a3a5ce5e3139/JNCC-Report-432-FINAL-WEB.pdf . [Accessed 16/04/25]

Ref. 3.17.B.16 RPS. (2019). Review of cable installation, protection, mitigation, and habitat recoverability. The Crown Estate.

Ref. 3.17.B.17 JNCC (1029). Subtidal sand. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20190307234526/http:/jncc.defra.gov.uk/page-5803. [Accessed 16/04/25]

Ref. 3.17.B.18 Tyler-Walters, H., & Sabatini, M. 2017. Arctica islandica Icelandic cyprine. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [online]. Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/species/detail/1519. [Accessed 16/04/25]

Ref. 3.17.B.19 OSPAR. (2008). OSPAR List of Threatened and/or Declining Species and Habitats. Available at: https://ospar-archive.s3.eu-west-1.amazonaws.com/DECRECS/AGREEMENTS/08-06e_agreement_ospar_list_species_and_habitats.pdf?X-Amz-Content-Sha256=UNSIGNED-PAYLOAD&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAJIACMW2T5USCSU5A%2F20250416%2Feu-west-1%2Fs3%2Faws4_request&X-Amz-Date=20250416T141033Z&X-Amz-SignedHeaders=host&X-Amz-Expires=900&X-Amz-Signature=74acacf425ccbe0864d1f439dd36d47ca507c0cafbfac43ca66982189db140f2. [Accessed 16/04/25]

Ref. 3.17.B.20 OSPAR (2009). OSPAR Background for Ocean quahog *Artica islandica*. Available at: https://qsr2010.ospar.org/media/assessments/Species/P00407_Ocean_quahog.pdf. [Accessed 16/04/25]

Ref. 3.17.B.21 JNCC (2019) Holderness Offshore MCZ Feature Map. Available at: https://assets.publishing.service.gov.uk/media/5cefdd5bed915d7ba0589a81/holderness-offshore-mcz-feature-map.pdf . [Accessed 16/04/25]

Ref. 3.17.B.22 Orsted (2021). Hornsea Project Four: Environmental Statement (ES), Volume A5, Annex 2.3: Marine
Conservation Zone Assessment. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-000758-A5.2.3%20ES%20Volume%20A5%20Annex%202.3%20Marine%20Conservation%20Zone%20Assessment.pdf. [Accessed 16/04/25]

Ref. 3.17.B.23 Centrica (2024). Rough Alpha Installation - 47/8A Decommissioning Programme. Available at: https://www.centrica.com/media/0paip1yw/rough-alpha-installations-decommissioning-programme.pdf. [Accessed 16/04/25]

Ref. 3.17.B.24 KIS-ORCA (2024) Map. Available at : https://kis-orca.org/map. [Accessed 16/04/25]

Ref. 3.17.B.25 NSTA (2024). NSTA Offshore Infrastructure (ETRS89). Available at: https://opendata-nstauthority.hub.arcgis.com/maps/2d8d2522c07f4b5c89ffb3ceec658d30/about. [Accessed 16/04/25]

Ref. 3.17.B.26 JNCC (2016). Scientific advice on possible offshore Marine Conservation Zones considered for consultation in 2017. Available at: https://data.jncc.gov.uk/data/4ea8c2c1-0176-4f6f-b4be-40b90719cabc/JNCC-T3PreConsultationAdvice-PossibleOffshoreMCZs-v3.0.pdf. [Accessed 16/04/25]

Ref. 3.17.B.27 European Environment Agency (2023). An introduction to habitats. Available at: https://www.eea.europa.eu/en/topics/in-depth/biodiversity/an-introduction-to-habitats. [Accessed 16/04/25]

Ref. 3.17.B.28 Orsted (2021). Hornsea Project Four: Environmental Statement (ES), Volume A5, Annex 2.3: Marine
Conservation Zone Assessment. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-000758-A5.2.3%20ES%20Volume%20A5%20Annex%202.3%20Marine%20Conservation%20Zone%20Assessment.pdf. [Accessed 16/04/25]

Ref. 3.17.B.29 Orsted (2021). Hornsea Project Four: Environmental Statement (ES), Volume A4, Annex 6.1: Compensation Project Description, Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-000749-A4.6.1%20Volume%20A4%20Annex%206.1%20Compensation%20Project%20Description.pdf. [Accessed 16/04/25[

Ref. 3.17.B.30 NE and JNCC (2022). Annex H. Ecological narratives: Supplementary documentation on the ecological merit of the candidate Highly Protected Marine Areas in English waters. Available at: https://consult.defra.gov.uk/hpma/consultation-on-highly-protected-marine-areas/supporting_documents/HPMA%20consultation%20Annex%20H%20Ecological%20narratives%20.pdf. [Accessed 16/04/25]

Ref. 3.17.B.31 JNCC (2020). Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs Wales & Northern Ireland) 8091. JNCC Report No. 65 4 (England, JNCC, Peterborough, ISSN 0963)

Ref. 3.17.B.32 JNCC (2017). JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys. Available at: https://data.jncc.gov.uk/data/e2a46de5-43d4-43f0-b296-c62134397ce4/jncc-guidelines-seismicsurvey-aug2017-web.pdf. [Accessed 16/04/25]

Ref. 3.17.B.33 Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P and Tyack, P.L. (2019). Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects. Aquatic Mammals 2019, 45(2) 125-232.

Ref. 3.17.B.34 NMFS. (2024) 2024 Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0). NOAA Technical Memorandum NMFS-OPR-71.

Ref. 3.17.B.35 IAMMWG. (2023). Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091. Available at: https://hub.jncc.gov.uk/assets/b48b8332-349f-4358-b080-b4506384f4f7. [Accessed 16/04/25]

Ref. 3.17.B.36 Gilles, A, Authier, M, Ramirez-Martinez, NC, Araújo, H, Blanchard, A, Carlström, J, Eira, C, Dorémus, G, FernándezMaldonado, C, Geelhoed, SCV, Kyhn, L, Laran, S, Nachtsheim, D, Panigada, S, Pigeault, R, Sequeira, M, Sveegaard, S, Taylor, NL, Owen, K, Saavedra, C, Vázquez-Bonales, JA, Unger, B, Hammond, PS (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64 pp. https://www.tiho-hannover.de/itaw/scans-iv-survey

Ref. 3.17.B.37 Southall, B.; Bowles, A.; Ellison, W.; Finneran, J.; Gentry, R.; Greene, C. Jr.; Kastak, D.; Ketten, D.; Miller, J.; Nachtigall, P.; Richardson, W.; Thomas, J.; Tyack, P. (2008). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33(4), 273-275. https://doi.org/10.1080/09524622.2008.9753846

Ref. 3.17.B.38 Gordon, J., Gillespie, D., Potter, J., Frantzis, A., Simmonds, M. P., Swift, R., & Thompson, D. (2003). A review of the effects of seismic surveys on marine mammals. Marine Technology Society Journal, 37(4), 16-34.

Ref. 3.17.B.39 Thompson, P. M., Brookes, K. L., Graham, I. M., Barton, T. R., Needham, K., Bradbury, G., & Merchant, N. D. (2013). Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. Proceedings of the Royal Society B: Biological Sciences, 280(1771), 20132001.

Ref. 3.17.B.40 Sarnocińska, J., Teilmann, J., Balle, J. D., van Beest, F. M., Delefosse, M., & Tougaard, J. (2020). Harbor porpoise (Phocoena phocoena) reaction to a 3D seismic airgun survey in the North Sea. Frontiers in Marine Science, 6, 824.

Ref. 3.17.B.41 JNCC, Natural England and Countryside Council for Wales (2010). The protection of marine European Protected Species from injury and disturbance - Guidance for the marine area in England and Wales and the UK offshore marine area. Available at: https://assets.publishing.service.gov.uk/media/5dea1d35e5274a06dee23a34/Draft_Guidance_on_the_Protection_of_Marine_European_Protected_Species_from_Injurt_and_Disturbance.pdf. [Accessed 16/04/25]

Ref. 3.17.B.42 EMODNet (2024). EMODnet Map Viewer. Available at: https://emodnet.ec.europa.eu/geoviewer/. [Accessed 16/04/25]
43 SCOS (2019). Scientific Advice on Matters Related to the Management of Seal Populations: 2021. Available at: https://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf. [Accessed 16/04/25]

Ref. 3.17.B.44 Hastie, G. D., Donovan, C., Götz, T., & Janik, V. M. (2014). Behavioural responses by grey seals (*Halichoerus grypus*) to high frequency sonar. Marine pollution bulletin, 79(1-2), 205-210.

Ref. 3.17.B.45 Stone, C.J. 2015. Marine mammal observations during seismic surveys from 1994-2010. JNCC report, No. 463a. Available at: https://data.jncc.gov.uk/data/6d72ac10-6bc8-446e-81d1-5990e79ed626/JNCC-Report-463a-FINAL-WEB.pdf. [Accessed 16/04/25]

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